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Adenoma of the thyroid gland. These water colors illustrate the section surface of the adenomatous goitre. They were made from fresh specimens removed at operation. B, One-half natural size.

INTERNATIONAL CLINICS

A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND
ESPECIALLY PREPARED ORIGINAL ARTICLES

ON

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PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY,
OTOLOGY, RHINOLOGY, LARYNGOLOGY,
HYGIENE, AND OTHER TOPICS OF INTEREST
TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION
THROUGHOUT THE WORLD

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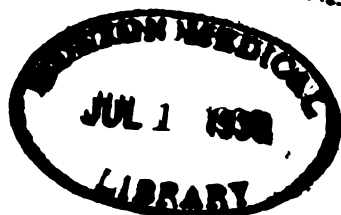
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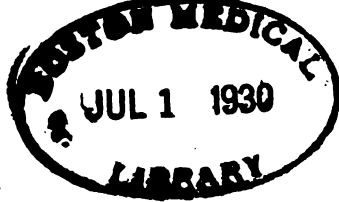
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Treatment

SCIATICA: ITS NATURE AND TREATMENT*

BY SIR DYCE DUCKWORTH, M.D., LL.D., F.R.C.P.

Consulting Physician to St. Bartholomew's and the Italian Hospitals; Senior Physician to the Seamen's Hospital, Greenwich

GENTLEMEN: The term sciatica describes a very painful condition of the great sciatic nerve, and derives its name from the Greek word for hip-joint, so that we might perhaps more properly speak of ischiatica. We are considering a disorder of the largest nerve in the body, one with a longer course than that pursued by any other nerve. You will find various descriptions of sciatica in medical literature. There it is sometimes termed femoro-popliteal neuralgia, but we are not familiar with the disorder in this form. If we consider that the nerve itself may fairly be regarded as a continuation of the sacral plexus, we can better appreciate the bulk of nervous tissue which is involved in any serious disorder of it.

The term sciatica, as we shall see, is useful in directing our attention to the nerve itself, and all parts which may be involved in its ailments. If we use it, we must always endeavor to discover the particular variety which is present in any given case, for there are several *species* of the *genus* sciatica.

We shall do best if we regard this painful disease as mainly due first, to a morbid state affecting the intimate textures of the nerve itself, and secondly, as a result of gross disease of some adjacent part in the course of the nerve. I have already stated that we recognize nothing that may properly be called neuralgia as affecting the great ischiatic nerve in the sense that we use the term in respect of facial or occipital neuralgia for example. The features of neuralgia lead us to recognize a paroxysmal or recurrent painful state, and to note that these may long persist and yet induce no obvious trophic change such as wasting of muscle.

* A clinical lecture delivered at the London School of Clinical Medicine.
Vol. III, Ser. 18—1

To justify this assertion, I will not omit the mention of occasional textural change which may occur in the form of canities or gray hair in some cases. We cannot regard such changes as morphœa or facial hemiatrophy as a result of pure neuralgia. There is a deeper and more grave condition present in the nerves involved in these lesions. We may declare then that the ischiatic nerve is not prone to neuralgia as we understand this disorder. Now we do find, not seldom, that sciatica, if severe and prolonged, is apt to induce wasting of the muscles and other textures supplied by the disabled nerve; and we can have no doubt that the nature of the mischief is of an inflammatory kind, in short, that it is a true perineuritis or an actual neuritis. The older physicians do not appear to have recognized, what to us is now too sadly familiar, the existence of neuritis or inflammation of nerve textures. If we doubted the fact as a clinical observation, we should be convinced by *post mortem* investigation which has fully proved it. So we come to this, that sciatica proper is in most instances a neuritis of the great ischiatic nerve. The process may be of large extent or only in patches in the course of the nerve. The disease too often displays for us a perfect picture of the precise anatomy of the nerves, including many of its earlier and later branches. In this, as in any form of neuritis, there is intense pain in the nerve and the parts supplied by it, any movement involving pressure or stretching of the ischiatic cord causes instant pain. Pressure over the ischiatic notch causes pain, and the course of the nerve may be followed down to the ankle and along the plantar branches. Other branches of the sacral plexus may be involved in sciatica, and lead to pains in the perineum and superficial parts of the lower limb. So much for the morbid anatomy of the disorder when strictly confined to nerve-structures, constituting what is properly called *primary* sciatica. Other sources are to be traced in cases where the sacral plexus itself, or the nerve alone, is pressed upon by tumors in the pelvis, diseased bone, or injuries sustained by the hip-joint, and in rebellious cases of this ailment attention must be paid to all these possible conditions, examinations made *per rectum* and *per vaginam*, and particularly of the hip-joint, skiagraphy being employed for the more accurate determination of these points. These cases are sometimes described as *secondary* sciatica.

The attack may begin gradually or suddenly. Sometimes the first symptom occurs in the loins in the form of lumbago, especially at the insertion of the lumbar fascia, near the posterior superior spine, extending down the buttock towards the sciatic notch, by a spreading gouty or rheumatic process, sometimes termed fibrositis.

Causes of Sciatica.—Exposure to cold and damp are common excitants, but chiefly in persons of the arthritic habit, and in most cases there are plain indications of a gouty proclivity, either inherited or provoked. It is less frequently met with in the subjects of overt articular gout. Women are not nearly so liable as men to suffer, the latter affording examples in the proportion of four to one. The period of life in which it is most common is from forty to sixty years, the ages at which gouty manifestations are most frequent. Sciatica has been called hip-gout, but this is an undesirable term to apply to it. Disease in and around the hip-joint may cause pain simulating primary sciatica to some extent, superficial branches of the sciatic nerve being involved, but there is no pain in the main distribution of the nerve. In *malum senile*, and after injuries from falls, there may be sciatic pain. Constipation of the lower bowel is sometimes a cause, and purgation is then found to afford relief.

Prognosis.—The course of the disease may be long and protracted. Complete recovery is the rule, but relapses may occur, and the nerve may be damaged in parts by the abiding inflammatory process, and fail in its full function subsequently. The more severe the attack the longer the recovery is retarded. Much depends on appropriate treatment and adequate rest of the affected limb. The prognosis is obviously grave in the case of secondary sciatica dependent on new growth. The primary form is apt to be very rebellious to treatment, in some cases extending over many months.

Treatment.—It is true, as commonly asserted, that most cases of primary sciatica ultimately recover. The list of remedies, local and general, that has been recommended is a very long one, and when this is the case in any given malady, we may be sure that there is no specific for it. The essential element is certainly rest in a warm bed. In America, a long splint is sometimes used to secure this. I have no experience with this method. Topical applications are seldom of decided benefit, but several of these are com-

monly employed. A single hypodermic injection of morphine has been all that was needed in some cases. It is important to discover the condition of the patient's general health, and to discover if there be any gouty taint or heredity. It is also important to recognize that we have to deal with a definite perineuritis or a neuritis in the largest nerve-mass in the body. The sufferer may be in poor general health, weak and anæmic, or he may be plethoric. The treatment will vary accordingly. Mustard plasters applied along the line of the nerve are useful, or cantharidine blisters. The liniment of iodine has much the same counter irritant action. Cocaine injections gr. $\frac{1}{6}$ to gr. $\frac{1}{2}$ are recommended. A 20 per cent. solution made by means of oil of cloves may allay pain. The unguentum capsici freely applied, and covered with cotton wool affords relief, and may be assisted in its action by hot sand bags or hot water bottles laid along the limb. Acupuncture has been of use in my hands, four needles (with handles)—four inches long—being pushed down at intervals into the nerve, and kept there for ten minutes. Injection of one or two cc. of sterilized water in the nerve are found to do good, and small injections of osmic acid (m.vii 1 per cent.), or of potassium osmate have been helpful in some cases. It may be necessary to try many of these remedies in a protracted case. These are painful operations. Internally aspirin in full doses is certainly useful, gr. x three times in the day. The bowels should be kept freely open with Gregory's powder or sulphur, and these may be given daily. Guaiacum resin in tablets of gr. v or combined with sulphur are helpful, especially in cases with gouty tendency.* Quinine and iodide of potassium is another combination suitable for similar cases.

Patience, rest in bed, and warmth are, however, the essentials of treatment. It is important to maintain as level a position in bed as possible, with the feet slightly raised. All noise and excitement should be avoided. The diet should be plain but nourishing. Good port wine is beneficial in some cases if it does not disagree or in any way provoke pain. The general health should be maintained. A dry climate with sunshine is of high importance in the lingering cases, and a course of warm baths at some spa, Aix-les-Bains or Bath are among the best resorts for this purpose. Care is necessary against relapses by over fatigue, exposure to draughts

or damp air, and flannel clothing all over the body is imperative. Electrical treatment is vaunted for these cases. It is intolerable in the acute stages. High frequency currents have been found beneficial in the later stages when carried on for some weeks. The light baths have also proved of service, but a course of at least four and twenty, carried out for twenty minutes each time, is required to judge of its effects. Massage is contraindicated in the acute stages, and generally does harm, even if it can be borne. Every layman and lay woman has a certain remedy for this ailment, and when this is the case we may be sure that we have no specific for it. The inflamed nerve is almost certainly left damaged and weakened by a severe attack, and hence is liable to suffer again under even slight provocations. Long continuance of damp and sunless weather is very apt to induce this ailment. Patients who can do so should winter in Egypt or Algeria to promote recovery from a prolonged attack.

In secondary sciatica due to new growths in the pelvis or the iliac bones, we can but palliate the suffering, and employ such anodynes internally and locally as best meet the varied indications.

THE TREATMENT OF PERTUSSIS BY FLUOROFORM

BY PAUL L. TISSIER, M.D.

IN the treatise on phthisis of the larynx which I published in 1889 in collaboration with Gouguenheim, inhalation of chloroform vapor was mentioned as the therapeutic means that had given us the best results in spasm of the glottis. I had already at that time made use of the same treatment with success in serious cases of pertussis, characterized by violent and prolonged coughing fits; but this was naturally an exceptional method, which could not possibly come into general use.

For this reason when Stepp in 1889 and Lowenthal in 1890 recommended bromoform for this purpose I began to make use of it in my practice. Bromoform gives excellent results, and would undoubtedly have become the favorite remedy for pertussis, were it not dangerous. All those who have made use of this remedy know with how much precaution it has to be handled, and how frequently it gives rise to accidents unless its use is interrupted the moment there are any signs of somnolence; it may even cause death, as was the case with a patient of Nauvelaer, a child of one year old, who was taking eight times a day two drops of an equal part mixture of alcohol and bromoform.

When I abandoned bromoform, in spite of its undeniable efficacy, I was led to try other substances of the same series; of these I will only mention two, on account of the results that they have given: iodoform, on which it is not necessary to dwell at present, and fluoroform.

Formene, or methane, is the basis of several groups of substances obtained by substitution that are of interest to the physician. The halogenic substances, chlorine, bromine and iodine, give in combination with it mono-, bi-, tri-, and tetra-halogenic derivatives, among which it will suffice to mention methyl-chloride, chloroform, perchloride of carbon, bromoform, and iodoform. A substitution product analogous to the tri-halogenic derivatives has been obtained by Moissan by means of fluorine. It bears the name

of fluoroform and its formula is C_2HFl_3 . It has been studied in turn by Meslam and by Chabrié, and is obtained from the action of fluoride of silver on chloroform, bromoform or iodoform. The following information concerning it has been furnished to me by Lépinos: It is a colorless gas with a slight odor of chloroform; its density is 3.09; it can remain liquid up to the temperature of 15° ; it is very soluble in absolute alcohol, but slightly soluble in water, about 2.8 per cent. It attacks glass, and gives rise to silicium fluoride, which no doubt explains the origin of the gelatinous flakes frequently seen in an aqueous solution of this gas kept in bottles.

Binz showed in 1891 that the action of fluoroform gas was analogous to that of chloroform. Stepp made use in tuberculosis, and later on in pertussis, of the aqueous solution of fluoroform, or fluoroform water. The latter, of which I have made use exclusively, has neither color, smell nor taste.

Pertussis is a common disorder whose gravity is far greater as a general thing than that given by the text-books. It is only necessary to refer to the weekly health report of the city of Paris to become convinced of the relatively high death-rate from pertussis; these figures agree furthermore with those given by Hagenbach, of Bale:

From 0 to 1 year	mortality 26.8 per 100
From 1 to 2 years	mortality 13.8 per 100
From 2 to 5 years	mortality 3. per 100
From 5 to 15 years	mortality 1.8 per 100

In the last six years I have treated with fluoroform water a large number of cases of pertussis; but my statistics are only complete during the last four years, during which the number of patients treated was exactly 117.

In not a simple instance did I observe any accident, however unimportant, imputable to the remedy, even when the dose prescribed was largely exceeded, as was the case on several occasions. It can also be mentioned that this harmlessness of the remedy has also been reported by all the writers who have used it.

Even the most intractable children make no difficulty whatever about taking the remedy, owing to its entire absence of smell and taste.

It may be well to take a rapid glance here at its action: (1) on the number and intensity of the coughing fits; (2) on the complications; (3) on the duration of the disorder. I wish before going any farther to lay stress on the important detail that the fluoroform was the only remedy used, except in certain cases to be referred to later on, in which I used iodoform either simultaneously or consecutively.

1. *Number and Intensity of the Coughing Fits.*—For two years now I have required the parents of the patients to keep a regular account on an ordinary temperature chart of the daily number of attacks, dividing the day into two periods beginning respectively at 7 A.M. and 7 P.M.; they mark in the day and night columns from the bottom upwards a dot for each small attack and a dash for each big one. Examination of the chart thus drawn up each day supplies information that is at least as valuable as the temperature chart in an acute disease. On the second or third day from the time when the fluoroform is begun, the number and intensity of the attacks is observed to decrease very noticeably if the dose administered is sufficient; thus in an average case of pertussis with 30 attacks per 24 hours, by the third day the number of attacks will have decreased by one-third, and will very rapidly descend to one half.

At the same time that the number of attacks decreases, and perhaps in an even still more striking manner, their intensity diminishes, and it is customary with this medication to observe after a few days the disappearance of the mechanical complications of the coughing fits. Vomiting, which has such an unfortunate effect on the patient's general condition, particularly with very young children, disappears; hemorrhage either stops when it existed or does not occur at all; the sublingual ulceration heals up, which, it may be said in passing, is an argument against its specific nature.

The number of the attacks and their intensity is as everyone knows a serious element in estimating the gravity of pertussis; if there were more than 40 attacks a day Trousseau looked on a case of pertussis as grave, and above 60, he considered that a fatal issue was to be apprehended. But with the fluoroform treat-

ment alone I was able rapidly to cure a baby eleven months old with 70 coughing fits per 24 hours!

The number of attacks decreases slowly but regularly for a week or two,—the attacks on awakening in the morning have appeared to me to be the most tenacious,—and at the end of a period that varies between 10 and 30 days the coughing fits disappear. It is quite exceptional for there to remain more than ten attacks per diem after a week of treatment, even in the most severe forms.

2. *Complications.*—I have already spoken of what are known as the mechanical complications, and these do not occur with the fluoroform treatment; this is equally true, at least in my series of cases, with the nervous complications, as well as those of the pulmonary apparatus. I have never seen a patient with whom the fluoroform treatment had already been begun develop broncho-pulmonary complications. On the other hand I began the treatment in 21 cases with such complications already existing: with 6 these was apyretic bronchitis, with eleven febrile bronchitis, with three bronchopneumonia, and once a condition of alarming dyspnoea that could be explained neither by the signs detected by systematic examination of the lungs nor by that of the other organs. In these 21 cases I used, together with the fluoroform, the customary methods of counter-irritation; but it appeared to me that the use of the fluoroform had an indisputable effect on the evolution of the complications, which all ended rapidly in recovery.

3. *Duration of the Disorder.*—It is difficult to fix the exact duration of pertussis. Leaving out of account the first or catarrhal stage, the text-books give an average duration of four or five weeks; but we all know that certain cases go far beyond that time, and that they are not by any means exceptional. With fluoroform the shortest case that I have had was one of ten days, in a child of seven years; Stepp has reported one of six days; in small family epidemics, where the cases can be treated from the start, the coughing fits are almost entirely done away with, and in a week the disorder is ended, in many instances.

The important point to be remembered in this connection is that by the end of the first week as a general thing the disease has lost all character of gravity and that it is quite an exceptional thing for recovery not to have been obtained in a month.

All of my 117 cases recovered. As regards their age, which is one of the principal factors in the gravity of the disease, they can be classified as follows:

From 0 to 1 year	5 cases
From 1 to 2 years	13 cases
From 2 to 5 years	21 cases
From 5 to 10 years	53 cases
Above 10 years	28 cases

In a word, this 2.8 per cent. fluoroform water is a remedy that is easily accepted, has no risks, and gives results in pertussis of such a nature that I am almost inclined to speak of it as a *specific treatment!*

The tenacity of certain spasmodic forms of cough in adults, supposed to be connected with tracheobronchial glandular enlargement, is well known. Now the efficacy of fluoroform in some cases of this order has led me to believe that they are merely prolonged forms of pertussis, such as are known to occur with grown persons. In these cases the fluoroform treatment would, if my personal experience proves true, suffice to clear up the diagnosis.

When the fluoroform water does not produce the desired results, the dose is insufficient, as I have observed a number of times. This is due in part to the relatively high price of the drug, which does not always allow us to prescribe it in sufficient doses and for a long enough period of time in the poorer classes.

In the relatively frequent cases where after recovery from the disease the coughing fits reappear with the simplest cold, I have used with the greatest success iodoform, given in the form of pills. I hope at some future time to take up the question of the use of iodoform in the treatment of pertussis, and at the same time I shall endeavor to interpret the general method of action of the halogenic derivatives of formene in this disorder.

As regards the question of doses, I give, up to the age of 2 years, one drop after each attack the first day, 2 the second, 3 the third, and so on, without exceeding as a general thing 5 grammes (100 drops) per diem of fluoroform water.

Between 2 and 4 years I give 10 drops 4 times a day, and increase gradually up to 5 or 10 grammes per diem. Above that

age, it is possible to go to 15 grammes, and with adults to 30 per diem, given in teaspoonful doses.

As the remedy is not toxic I am convinced that these doses could be largely increased; but in the great majority of cases I have not found it necessary to give larger amounts. Several of my patients took the remedy in tablespoons, instead of in teaspoon doses, without any trouble ensuing therefrom.

The preparation can be given in water, or in milk, but as it is practically without taste or smell it can be taken just as it is. On account of the alteration that takes place when the solution is kept in glass bottles, it is desirable that the remedy should be freshly prepared.

It would have been possible for me to cite a far larger number of cases gathered among friends to whom I had recommended the process; but I have thought it preferable to use only those that I have myself followed during the entire course of the disease.

TWO CASES OF TETANUS TREATED WITH CHOLESTERIN WITH RECOVERY

BY M. ALMAGIA, M.D., AND G. MENDES, M.D.,
of Rome

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STIMULATED by the classical researches of Wassermann and Takaki, who, in 1898, showed the relation existing between the tissue of the central nervous system and tetanus toxin, one of us (Almagià), in 1906, tried to determine the exact substance in the brain and the spinal marrow which is capable of fixing the tetanus toxin, as well as the nature of that process of fixation. Availing ourselves for the experiments of gray rats and guinea-pigs, after a long series of researches, the conclusion was arrived at that lecithin and cholesterin possessed the same property of fixing tetanus toxin as the central nervous substance *in toto*. When the tetanus toxin was first kept in contact with certain quantities of lecithin or cholesterin for 2 or 3 hours at a temperature of 37° C., one could inject the animals with several times the fatal doses of that toxin without killing them. The cholesterin is much more active than the lecithin in its power to fix and neutralize the tetanus toxin. Taking into consideration the fact that Wassermann ascribed an importance to his own researches inasmuch as they gave evidence of the truths of the lateral chain theory of Ehrlich ("Ehrlichsche Seitenketten Theorie"), in which it is assumed that the cells sensitive to the action of a poison are possessed of pre-formed recipients which are capable of fixing the poison itself, one of us (Almagià) was able to identify the lecithin and the cholesterin as the recipients, which, in the nervous substance, fixed the tetanus toxin. Following the ideas of Ehrlich who considers that these recipients are injurious to the organism as long as they are *in situ*, but that they confer immunity upon the organism when they are in the circulating blood

by reason of their property of neutralizing the toxin before it becomes linked to the sensitive cells of the nervous system, I performed experiments to ascertain whether injections of cholesterin could save the animals from the tetanic intoxication.

Numerous experiments on guinea-pigs convinced me of the value of the injections of cholesterin in the treatment of animals which had previously been injected with tetanus toxin, and my conviction was such that Dr. G. Mendes and I felt authorized in attempting this method of treatment on the human subject.

We wish now to report the clinical histories of two patients affected with tetanus, who were admitted into the "Policlinics," of Rome, with severe symptoms of the disease, and who were submitted by ourselves to the treatment by cholesterin, with resulting recovery.

The first patient, a priest, 26 years old, was admitted into the isolation wards of the "Policlinics," on December 9, 1906. Sixteen days previously he had imprudently handled a hunting-gun which exploded, so that the shot struck him directly in the palm of his left hand, causing a perforating wound in that hand with great destruction of the soft parts, and a fracture of the third metacarpal bone. The healing of the wound progressed well for about twelve days after the occurrence of the accident; and it was only four days before the admission to the hospital that the patient began to complain of a very severe pain which radiated from the metacarpophalangeal articulation of the middle finger of the wounded hand toward the last three fingers of that hand. A day later he complained of pain in the region of the lower maxillary articulation and in a few hours he was unable to open his mouth. Gradually all the fingers of the wounded hand became flexed (bent) by a very strong and permanent tonic contraction over the palm of the hand, and the hand itself was contracted with a maximum of flexion over the forearm. A few hours later the muscles of the nape of the neck became rigid, so that movement of the head was very difficult and painful; deglutition became impaired. Twenty-four hours before his entrance into the hospital his back became rigid, and the patient was seized with most painful contractions which repeated themselves every four or five minutes, and tired him exceedingly. The temperature which since the accident had been normal increased

in the last two days and exceeded 38° C. The treatment before the patient's entrance into hospital had been merely symptomatic, and consisted in the administration of opiates, sedatives, and a local antiseptic dressing.

The result of the examination on December 9, 1906, was as follows: S. F. has a normal configuration of his skeleton; his fat-layer is rather well developed; his muscles present a normal development. The organs of the chest and abdomen are healthy. The movements of the eye are normal; the pupil shows a normal reaction to light and accommodation. The forehead appears wrinkled in the region of the glabella; the nasal wings are drawn laterally. The masseter muscles are much contracted and prominent under the skin, and when the patient is asked to open his mouth he succeeds in doing so only to the extent of half a centimetre. His speech is difficult and sibilant. Deglutition is impaired. The movements of the head and neck are limited, and on trying to bend the head forward a great resistance is met with. The extensor muscles of the back are much contracted, so that it becomes impossible to make the patient bend forward; it is equally impossible to make him sit in his bed. At the time of the observation he is shaken every four or five minutes by violent contractions of the muscles of the back which produce opisthotonos; these convulsions are involuntarily produced by the slightest excitations. The movements of the upper and lower extremities (except, of course, the wounded one) is unchanged. Also the reflexes are unaltered, and the general and specific sensations are normal. The patient is perfectly conscious.

On examining the *wounded region* one notes that the left hand is strongly contracted in the state of flexion over the forearm, and that the fingers are contracted to such a degree in a flexed position over the palm of the hand that it is impossible to extend them even to a limited extent. Over the dorsal region of the hand under consideration there is a great loss of substance with irregular areas of quadrangular form, corresponding to the third metacarpal bone. The wound is granular, and at the base the peripheral stump of the fractured bone is visible. On the palm of the hand the wound, viz., the hole of entrance of the shot, is much smaller and less readily seen

owing to the very violent contractions of the fingers which prevent the hand from being opened. With a probe one may follow the canal made by the bullet, and may trace the direct communication between the two wounds on the opposite side of the hand.

The examination of the urine has not revealed the presence of albumin or sugar.

The clinical observation of the patient showed that his condition became progressively worse until the third day of his sojourn in the hospital, in spite of the fact that soon after his entrance into the hospital and upon the following day five millions of immunizing unities of the antitoxin of Prof. Tizzoni had been injected several times. The opisthonic contractions, the trismus, and the dysphagia gradually increased, and other threatening symptoms supervened. On the 6th of December the patient was very much agitated, and, from time to time, his contracted mouth assumed the appearance of "risus sardonius"; the respiration was dyspnoic with a painful sense of constriction at the chest; the respiration was 36, the pulse 108 a minute.

On account of the slight benefit derived from the serotherapeutic treatment that had been used, we administered on the third day after admission the first injection of cholesterin. Fifteen centigrammes of cholesterin suspended in ten cubic centimetres of warm distilled water were injected into the subcutaneous tissue of the external region of the left arm. Combined with this method of treatment all the other sedative remedies that are indicated in such a case, such as warm baths, morphia, and the bromide of chloral were employed. The local lesion was treated by washing the wound with the solution of cholesterin, and the pads of gauze which were introduced into the canal of the wound were likewise soaked in cholesterin. On the following day the condition of the patient was still worse; and it was, particularly, the duration and the painfulness of the opisthotonic contractions which had increased.

We continued subcutaneous injections of cholesterin, increasing the dose to twice the amount, viz., 30 centigrammes for each injection, and together with this the local and general treatment was continued.

During the following three or four days the state of the patient was more or less unchanged. Over the skin an eruption of acne

pustules appeared which was particularly localized to the upper part of the chest and the right arm. Later, on December 10th, patches of a red-violet color appeared over the same regions, and other similar ones, but lighter in color were seen in the left mammillary region. We must remark that no injections had been given over these parts. Except for the dysphagia which had diminished somewhat all the other symptoms were as severe as they were before the injections of cholesterin; and, moreover, a considerable degree of dulling of the intellect, together with subdelirium, illusions and hallucinations, had made their appearance.

We gradually increased the doses of cholesterin until an average dose of one and a half grammes a day was reached, the method of administration being invariably by subcutaneous injections over various parts of the body.

On the eighth day of the patient's sojourn in the hospital, and the fifth day of the treatment with cholesterin a certain degree of improvement of the tetanic symptoms was to be noted. The opisthotonic contractions became less frequent, the trismus had diminished, and the movements of the neck and trunk had become freer. The abnormal mental state of the patient, however, persisted, and this condition with occasional intervals of consciousness continued until the 17th of December, *i.e.*, the thirteenth day of the patient's sojourn in the hospital. On that day we could notice that the condition of the mind had become perfectly normal, and that the tetanic symptoms—except some rare opisthotonic contraction—had disappeared. There remained only the strong and permanent flexion of the left hand, which was due to the action of the contracted flexion muscles outbalancing that of the extensor muscles so extensively destroyed with the soft parts on the back of the hand at the time of the accident.

The wound showed a tendency towards healing; the excavation made by the entrance of the shot had already cicatrized; the larger wound of exit of the shot was granular and showed but little secretion of pus. The complete closure of the wound, however, was impeded by the fact that the phalangeal stump of the broken third metacarpal bone, which was rotated upwards, projected from the wound exposing its fractured surface.

During the following three days the slight contractions of the

muscles of the back gradually and completely disappeared, so that the recovery of the patient could be looked upon as being complete (on the 21st of December), and the further use of the cholesterin was discontinued. During the eighteen days which had passed since the date of the patient's entrance into the hospital fifteen grammes of cholesterin had been administered by subcutaneous injections, in fractional and progressively increasing doses.

During the following days the treatment was confined to the wound itself. On the 31st of December, after the patient had been placed under chloroform, the wound was laid bare, and a resection of the phalangeal portion of the fractured metacarpal bone was performed. The fingers were brought into a position of complete extension in which they were maintained by an appropriate apparatus. The patient could thus be dismissed from the hospital on the 13th of January.

The history of the second case was as follows: G. E., a cartman (waggoner), 19 years old, was admitted into the isolation wards of the "Policlinics," on December 15, 1906. Twenty days before this he had injured the thumb of the left hand with a hammer, causing a contused wound which was not as yet completely healed. Five days before his entrance into the hospital the patient noted a certain difficulty in opening the mouth, which was constantly increasing. This symptom was followed by a sensation of constriction in the chest, and shoulders, a sensation which was not constant in the beginning, but had become permanent during the last three days, at which time he was also seized with most painful cramps in the legs. For two days he also had fever.

The examination showed the following conditions: Skeletal structure normal; no excess of the fat layer; the musculature rather well developed; lymphatic glands normal. The organs of the chest and abdomen are healthy. Movements of the eye-balls normal. Reaction of the pupil to light and accommodation normal. The muscles of the face are contracted and give it the appearance of the "*facies tetanica*." The forehead is striated by horizontal wrinkles. The nose is pointed and the nasal wings are drawn forward to the side. The masseter muscles, which are very much contracted, do not allow the mouth to be opened in the slightest degree (trismus); it is drawn in a horizontal direction by an almost

continuous contraction, so that the teeth are almost always uncovered ("risus sardonicus"). The movements of the head are possible in every direction, though they are somewhat limited by the contraction of the muscles of the neck and nape. The equally contracted muscles of the back give the patient a rigid position, and on making an attempt to walk there comes on a tonico-clonical contraction of the long extensor muscles of the back by which the vertebral column is strongly curved backward. These contractions are most frequent, occurring twice in a minute, when he attempts to walk, and moreover they are most painful, so that the patient utters a cry at each attempt. The muscles of the chest and abdomen are also contracted. Respiration is difficult and dyspnoëic; there are 25 respirations in a minute, and the patient complains of a very painful sensation of constriction in the chest, the epigastrium and abdomen. There is also a remarkable difficulty in deglutition, so that the patient is scarcely able to drink milk. The motility of the upper extremities is unaltered. The lower extremities are kept forcibly in extension, so that it is impossible to test the knee-jerk. The sensitive and sensory organs are normal. Consciousness is perfectly intact.

On examining the wounded part mentioned above one sees that the nail of the left thumb is almost completely lifted off from the nail-bed, and only attached to its matrix by a small red crust. The urine is scanty and very dense; no albumin and no sugar.

The state of the patient continued almost unaltered for four days during which time eight grammes of an emulsion of cholesterin in distilled water were administered to him by subcutaneous injections. With the exception of hot baths, no other remedy was employed. Only on December 19th a certain diminution in the frequency and intensity of the opisthotonic contractions was noted. At the same time the disturbances of deglutition and respiration appeared to be relieved. The trismus, however, persisted almost unaltered. We increased the daily dose of cholesterin, until a maximum of two grammes and eight decigrammes a day was reached. At the morning visit of December 24th, we found the patient in much better condition. He had been, for several hours, free from the convulsive seizures, and the trismus had likewise diminished, so that he was able to speak without much effort. All

the other tetanic symptoms had diminished in intensity. Only the fever which had been up to that time rather slight, though continuous (38 to 38.5° C.) showed a tendency to rise to 39° then to 39.5° C. The daily dose of cholesterin was then diminished, and the improvement of the tetanic symptoms progressed.

On December 26th a limited area of bronchopneumonia was noted at the base of the right lung, and it was considered that this complication was sufficient to explain the increase in the temperature. Meanwhile the symptoms due to the tetanus infection were constantly diminishing.

The bronchopneumonia resolved rather rapidly, and the temperature became normal within a few days. At the same time the last tetanic symptoms which had still persisted, such as a moderate degree of trismus and rare contractions were gradually disappearing, so that on January 3, 1907, the recovery of the patient could be looked upon as complete, and the administration of the cholesterin was entirely discontinued. After ten days observation the patient was dismissed from hospital.

During the whole period of the patient's sojourn in the hospital, viz., 19 days, seventeen grammes of cholesterin were administered.

From the two histories which have just been recited it can be seen that two individuals suffering from a severe tetanus infection, treated with the subcutaneous injections of cholesterin, one of them treated exclusively by this method, the other submitted to this treatment after the antitetanic serum of Tizzoni had failed, have recovered in a rather short period of time. But have these two cases recovered as the result of the treatment with cholesterin, or had we rather to deal with two cases of the so-called chronic tetanus which frequently heals spontaneously? We do not believe that such an objection could be made, particularly with reference to the second case, in which the infection set in rapidly, and in which the symptoms were exceedingly severe. Furthermore, the improvement which came on in both cases four or five days after the treatment with cholesterin had been instituted, and the sense of subjective improvement felt by the patients soon after the beginning of the treatment with cholesterin, speaks very forcibly for the benefit derived from the injections. We believe that the cholesterin, when introduced into the organism, fixes the tetanus

toxin which is continually forming at the focus of infection, and that, by preventing it from reaching the central nervous system, gives the organism the time to rid itself of the toxin already fixed, and to defend itself by its own resources against the bacilli of the tetanus infection. The defence with which the cholesterin endows the organism is, therefore, merely an antitoxic one.

Only a larger series of cases and successes will determine how much truth there is in our supposition.

At any rate, we think it useful to have published these attempts at curing human subjects from an infection in which the mortality, in spite of the various specific sera and other methods of treatment, is, according to the most exhaustive statistics, still above ninety per cent.

Medicine

PERFORATION OF THE INTESTINE IN TYPHOID FEVER

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THE present index of sanitary intelligence in our towns and cities is such that it seems positive that it will be many years before typhoid fever will be eliminated from our communities. As long as we have typhoid fever in our midst, just so long will we have to meet one of its most dreaded complications—perforation of the intestine. Probably in no disease is the physician and surgeon brought face to face with a more serious group of symptoms, a patient already ill with a severe infection whose condition is rendered doubly serious by the advent of a perforative peritonitis which necessitates immediate operative interference without which comes the uniformly fatal termination.

FREQUENCY OF PERFORATION

The statistics of different countries vary as to the frequency of perforation. In 1905 I collected figures from English, Australian, Canadian and American hospitals, and found in 9753 cases of typhoid 1037 deaths in which 351, or 33 per cent. were due to perforation. In routine autopsy examinations on the Continent (Munich, Basle and Hamburg), perforation has been found in from 5.7 per cent. to 1.2 per cent. of the cases of typhoid fever. Clinical observation in the United States places the occurrence of perforation at about 2.5 per cent. to 3 per cent. among the total number of cases. In a series of cases studied at the Pennsylvania Hospital, Philadelphia, I have found in 4230 cases, with 349 deaths, 110 cases of perforation, or 31.5 per cent. In this study I am positive that at least 8 or 10 cases of perforation are excluded because I

desired either direct operative or autopsy proof of the perforation. In a certain number of cases examination was not permitted but symptomatically the perforation was considered positive: But three such cases have been included in these figures.

There is reason to think that the bath treatment has modified the occurrence of all complications in typhoid except possibly perforation and hemorrhage. The figures of Hare and of Brisbane, recently quoted by McCrae, give positive proof of this. He reports 1828 cases treated symptomatically in which the percentage of perforations was 2.9 and perforation the cause of death in 20 per cent. of the cases. In 1902 cases treated by bathing the number of perforation cases was the same (2.9 per cent.), but the proportion of perforation among the fatal cases rose to about 40 per cent.

The following table has been prepared from cases in the Pennsylvania Hospital, Philadelphia, since May, 1901, to May of the present year, and will give some idea of the ratio of perforations to the general mortality and other figures which may be of interest.

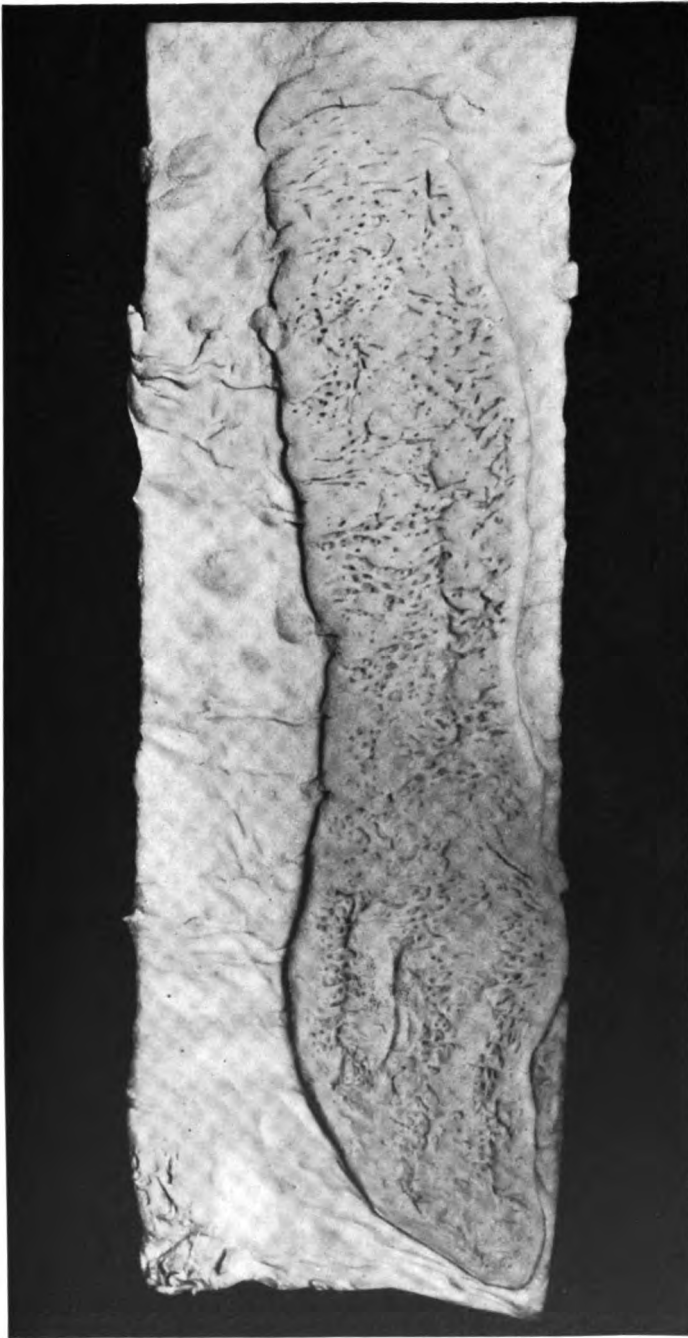
Year	No. o Cases	Total Deaths	Perfora- tions	Opera- tions	No. Opera- tions	Recovery
May, 1901-1902....	509	35	8	5	3	0
May, 1902-1903....	749	55	16	12	4	5
May, 1903-1904....	690	63	26	20	6	7
May, 1904-1905....	462	34	10	8	2	0
May, 1905-1906....	596	55	18	9	9	0
May, 1906-1907....	700	64	18	17	1	4
May, 1907-1908....	524	43	14	9	5	4
	<hr/> 4230	<hr/> 349	<hr/> 110	<hr/> 80	<hr/> 30	<hr/> 21

The total mortality is therefore 8.22 per cent. That is, in 4230 cases 349 patients died. The perforative mortality is 2.6 per cent., in 4230 cases 110 cases of perforation occurred. The proportion of perforations (110) to the total mortality (349) is 31.5 per cent.—a little less than 1 to every 3 deaths. The recoveries after operations show some improvement over the figures of past years: 110 cases, 80 of which were submitted to operation, with 21 recoveries, a percentage of 26.33.

MORBID ANATOMY

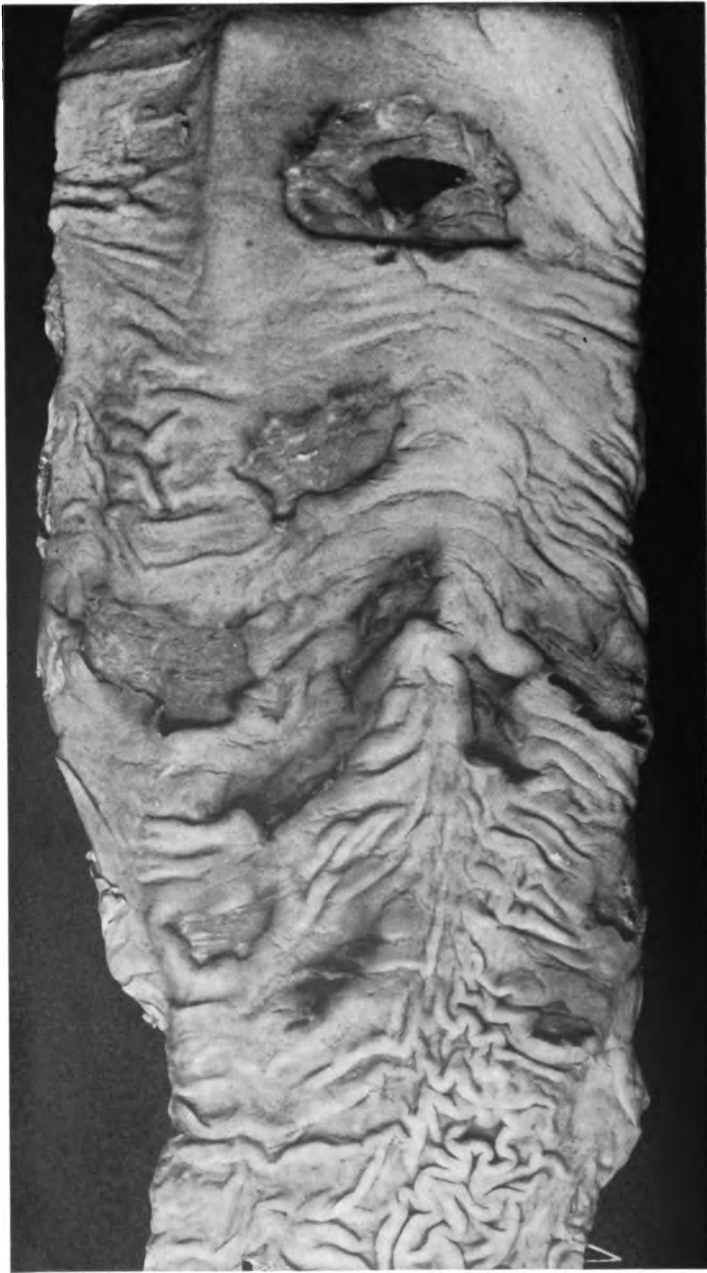
The morbid anatomy of perforation is to be found in the characteristic changes occurring in typhoid fever in the solitary and

FIG. 1.



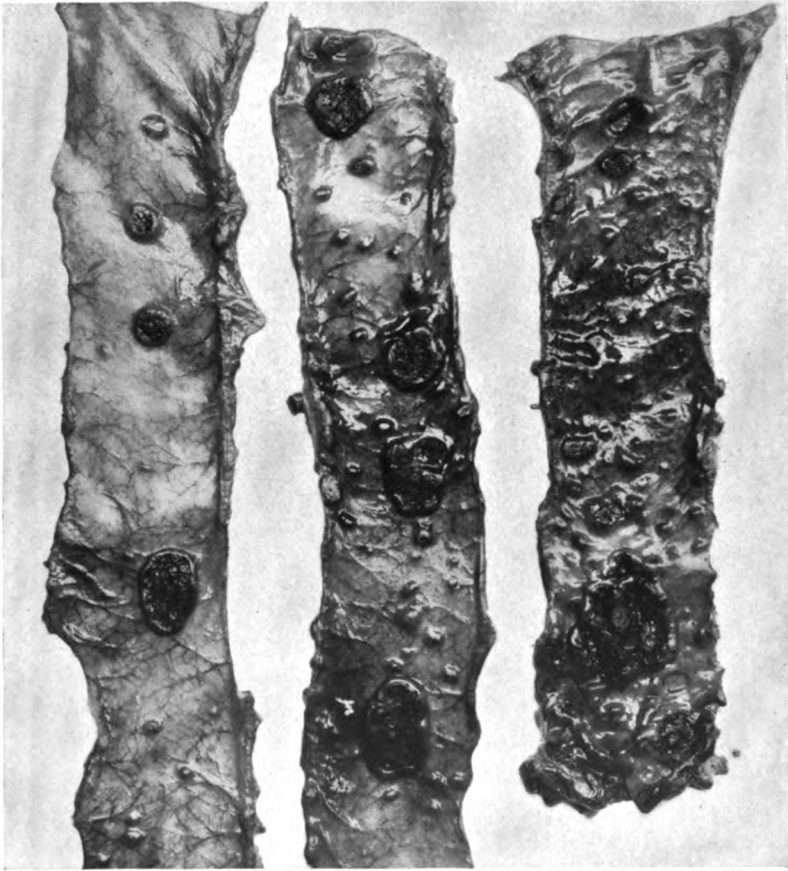
Ileum, showing infiltration of unusually large Peyer's patch. (Specimen from Museum, Pennsylvania Hospital.)

FIG. 2.



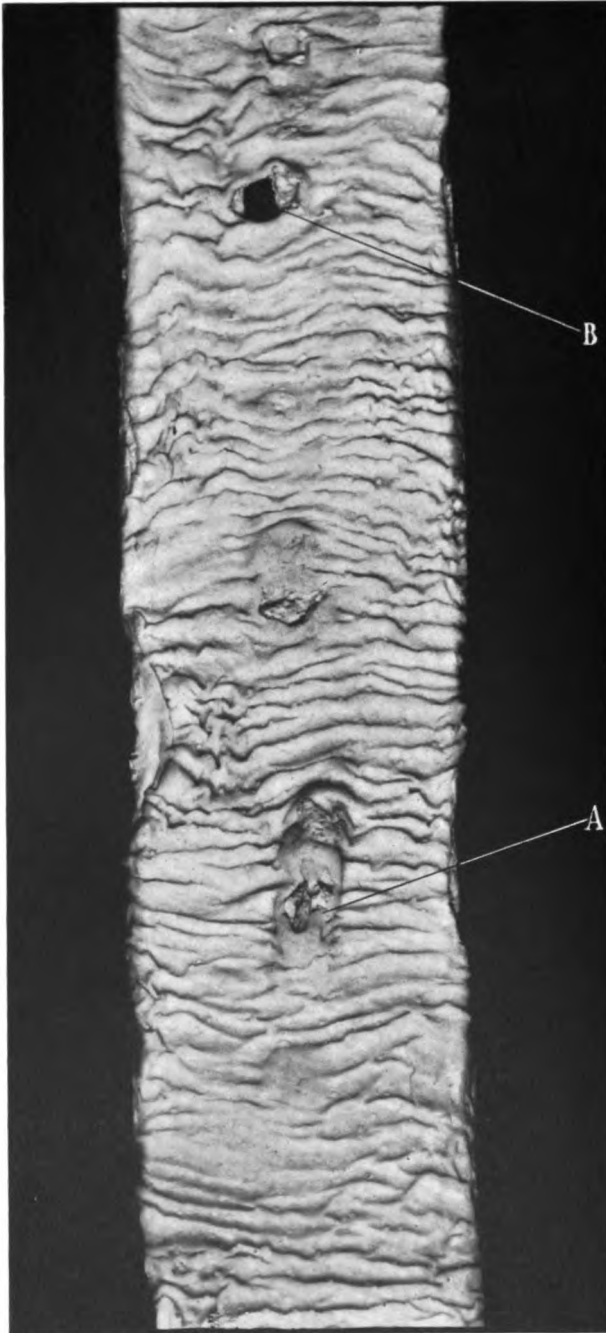
Colon, with large, necrotic perforation; other ulcers, with base of muscularis.

FIG. 3.



Ileum, showing various stages of infiltration, necrosis and ulceration in one case.

FIG. 4.



Ileum showing A, healed perforation, sutured at operation. B, secondary perforation. From specimen in Pennsylvania Hospital Museum.

agminated glands in the ileum, cæcum and colon. During the first ten or twelve days of the disease the lymphatic glands undergo a hyperplasia which causes them to swell, become prominent on the surface of the mucous membrane and by compression of the blood-vessels appear anæmic. This is the so-called "*medullary infiltration*" which is most intense in the lower end of the ileum (Fig. 1.), and is in turn followed either by resolution or necrosis. If the hyperplasia is too intense *necrosis* or *sloughing* of the patch occurs; anæmic necrosis—by which sloughs are formed, which must be separated and thrown off. This process may be either superficial or deep and upon this factor depends in large measure the chance of perforation. Ulceration is the result of the sloughing off process and is to be seen in its greatest intensity in the lower ileum, during the second and third weeks; and especially in the neighborhood of the ileocecal valve, where by extension of the process several ulcers fuse and sometimes form an ulcerating surface five, six or even eight inches in length, with here and there small islands of mucous membrane projecting. Ulceration usually reaches the muscular coat of the intestine. Perforation, if it occurs, is due to the extension of the ulcerative process through the muscular and serous coats of the bowel.

By far the most common site of perforation is the large ulcer situated some two or three inches above the ileocecal valve. The perforation is usually round or slightly irregular on the serous surface and averages 3 mm. in diameter—a pinhead. A second variety of perforation is much larger and is due to a necrosis of the entire base of an ulcer, sometimes measuring from one to three cm. in diameter. These necrotic areas are apt to drop out in toto or tear the entire length of the ulcer. This variety does occur in the ileum, but is more common in the large bowel (Fig. 2).

Factors increasing the intra-intestinal tension, such as excessive meteorism or unusual diarrhœa or repeated hemorrhage from the bowel make us regard with suspicion the increased chances of perforation. It is extremely difficult to estimate from symptoms the amount of ulceration occurring in the intestine. I have seen at autopsy an ileum in which but one ulcer was present, and that ulcer showed a perforation 1.5 cm. in diameter. In the light of the ulceration that can and does occur in some cases (Fig. 3), it

seems remarkable that perforation is not commoner than is at present suspected.

Autopsy shows that in a few instances perforations will close: in this series of 110 cases 3 closures of previous perforation were found—in each instance the sealing of the hole was accomplished by adhesion between the coil of intestine and the bladder wall.

Sometimes at operation the omentum is found—tucked in as it were—over a perforation, and in one instance reported by D. J. M. Miller, proved effectual in plugging the perforation, and recovery ensued.

Unfortunately, the patient usually succumbs to other complicating factors, induced by perforation or the disease.

Age.—As typhoid fever is a disease which mainly occurs in the youthful or young adult, we would naturally expect most of the cases of perforation to be in younger subjects. This is true of all the cases analyzed. In a study of 110 cases in the Pennsylvania Hospital there were 11 cases of perforation from 5 to 15 years; from 15 to 25 years, 31 cases; from 25 to 35 years, 42 cases; from 35 to 45, 18; from 45 to 55, 5, with two unrecorded.

Sex.—The men seem to be affected more frequently than women, but this is probably because we receive more men into our hospitals than women. In the series at the Pennsylvania Hospital there were 99 males and 10 females, of which 96 were white and 13 black.

The Number of Perforations.—The number of perforations varies; in the large majority of cases but one is present. In the present series of cases one perforation was present in 88 cases, 2 in 8 cases, 3 in 5 cases, 6 in 1, and the number not mentioned in 9.

The Size of the Perforation.—The size of the perforation is also variable, but by far the most common variety is the small pinhead size (3 mm.) perforation, which is usually within a short distance of the ileocaecal valve. This type of perforation is usually single but at times may be multiple (Fig. 4). It is not uncommon for two or three small perforations to exist in one ulcer, sometimes within a centimetre of one another and finally result in a long, irregular tear through the bowel. A second variety of perforation is the larger, necrotic area, oftentimes $1\frac{1}{2}$ to 2 or 3 cm. in diameter. This variety will sometimes occur in the ileum, but is more apt to be found in the caecum or colon. In one instance I saw a large

perforation in the ileum in a case in which two perforations about $1\frac{1}{2}$ cm. in width existed, through which holes frightful hemorrhage had occurred from the bowel into the peritoneal cavity. The size, therefore, of the perforations varies from 1 mm. up to 3 cm. In the present series of cases studied the size of the perforation was as follows:

1 mm. (pinpoint).....	4
2 mm.	2
3 mm. (pinhead— $\frac{1}{8}$ inch).....	38
5 mm. (slate pencil).....	10
6 mm. (lead pencil).....	8
17 mm. (10 cent piece).....	7
1 cm. ($\frac{3}{8}$ inch).....	1
2 cm.	1
3 cm. (50 cent piece).....	1
Perforated appendices	2
Not mentioned (all small).....	35

 109

THE RELATION OF PERFORATION TO THE ILEOCÆCAL VALVE

The perforation in the large proportion of cases is in the ileum and a great percentage of those in the ileum are within 12 inches of the ileocæcal valve. A favored spot for the perforation is the large ulcer immediately above the valve, so that the perforation through the serous membrane is 8 to 10 centimetres above the cæcum. The more uncommon sites of perforation are in the cæcum, the appendix, the colon and the sigmoid. In the group of cases studied in the Pennsylvania Hospital the perforations were situated as follows:

In the first 12 inches.....	57
In the second 12 inches.....	13
In the third 12 inches.....	1
In the fourth 12 inches.....	6
In the fifth 12 inches.....	1
In the colon.....	2
In the sigmoid.....	1
In the cæcum.....	2
In the appendix.....	4
Perforating gland	1
Localization not mentioned, but all in ileum.....	20
Unknown	2

THE PERIOD OF PERFORATION

A large proportion of the cases of perforation occur during the latter part of the second and the third week. Though perforation may take place after but a few days of illness or even as late as between the fortieth and fiftieth days. On some occasions it occurs after convalescence has set in and in other cases occurs during relapse. Between the *19th and 21st* days a considerable proportion of cases are found. In the series studied in the Pennsylvania Hospital the time of perforation was as follows:

First week	2	
Second week	22	} 87
Third week	48	
Fourth week	17	
Fifth week	15	
Sixth week	2	
Seventh week	1	

It can therefore be seen that about seventy-nine per cent. of the cases occur between the second and fourth weeks.

SYMPTOMS OF PERFORATION

The symptoms of perforation are best described under two headings: first, the symptoms at the time of perforation, and second, the symptoms of the result of the perforation,—that is, perforative peritonitis.

A. It must be recalled that a certain large proportion (50 per cent.) of the cases are sudden in their onset. In a smaller proportion the symptoms are gradual in onset (20 per cent.), and a smaller proportion (12 per cent.) lack all leading symptoms. The most important symptom of perforation, both subjective and objective, is the occurrence of sudden severe abdominal pain. There can be no mistaking its presence. I have known patients to be roused from a sound sleep and cry aloud in agony. The pain is usually paroxysmal, but may be continuous; commonly the paroxysm is not prolonged, sometimes lasting half an hour or more and then slowly passing away. I have known patients to fall asleep in the intervals of the paroxysm. Within half an hour or more the

pain may again return, perhaps with increased severity. The pain is usually localized to the right side of the abdomen, to the right of umbilical region, though in some cases the left lower zone or median line is the site. In a certain proportion of the cases (16 per cent.) a chill and less frequently vomiting is present. Sometimes a peculiar, pinched, anxious, painful expression of the face is of aid in determining the diagnosis. Sometimes pain may be referred to the bladder, producing frequent urination; and again to the testicle. The pain is of such character that the patient frequently pulls up the thighs, sometimes presses hard objects upon the abdomen or may turn over upon the belly for relief.

There may be but little variation in the pulse, or in respiratory and temperature ratio at this time. Changes of significant value in one or the other may occur, but by themselves may be misleading. The pulse rate usually increases slightly, the respiration may be unchanged and the temperature immediately after perforation rises one or two degrees, and during the following six or eight hours slowly falls below the normal line. In many cases no unusual effect upon the temperature can be determined.

Physical signs present in the abdomen in the early stages of perforation are, first, *tenderness*. This is usually marked in about 75 per cent. of the cases and in one-half of the cases localized to the site of the pain complained of. The palpating hand at once is bitterly resented and the intensity of the pain can often be judged by the character of the facial expression. The second most important sign is *rigidity* of the abdominal muscles. This is generally more marked on the right than the left side. It is less common than the presence of tenderness, but present in about 66 per cent. of cases. I have noted that rigidity is frequently best estimated during expiration when an abdomen otherwise rigid during inspiration will relax and become soft during the ascent of the diaphragm. I shall briefly mention other physical signs which may be of some importance.

The total disappearance of liver dulness is usually a late sign and not to be depended upon. In cases where the abdomen has been flat and not distended the sudden disappearance of liver dulness is of distinct aid. Sluggish or absent peristaltic sounds are of aid in the diagnosis as indicating the onset of a peritonitis.

Sometimes the breath sounds of an amphoric character are heard with distinctness in the upper abdominal zone when perforation has occurred and gas is present in the general peritoneal cavity. The blood-pressure usually rises after perforation, possibly as a result of both the pain and the oncoming peritonitis. The leucocyte count seldom rises enough to be considered a leucocytosis. It is of little or no help in the diagnosis.

Inspection of the abdomen is frequently of decided importance. First, the contour. If distention of the abdomen is not present at the time of perforation the abdomen is not apt to present the appearance of fulness but is even slightly retracted, especially in the lateral regions. There is usually within a short time after the perforation muscle-spasm, so that the abdominal wall is distinctly rigid. Careful inspection also shows a distinct diminution, and, as time goes on, practically complete cessation of the abdominal type of breathing. This is sometimes especially to be noted in the upper abdominal zones and usually most marked on the right side. In some cases it is not at all an important physical sign.

B. Symptoms of perforative peritonitis. Some four to six hours after perforation the symptoms of peritonitis begin to become the dominating picture of the case. Though the perforation may be very small, or even an attempt be made by nature to plug the perforation by omentum, once started, the infection of the peritoneum continues to gather headway, till at last the diagnosis, if not made heretofore, is thrust upon us.

The drawn, painful expression of countenance, the bright eye, the unusually alert mind, hoping much and knowing but little of the dangers ahead, the rapid, small pulse, the respirations mainly costal and hurried, the abdomen drum-like now, distended and tympanic with general tenderness but usually most marked in the right zones are all characteristic of the picture. Movable dullness, can now be detected in the flanks on careful percussion. Peristaltic movements of the intestines are not heard. Superficial palpation of the abdomen produces great pain. Vomiting may now begin. I have known it to start immediately after perforation and persist, consisting at first of the gastric contents, later of bilious material and finally become fecal. The skin may be bathed in a cold sweat. The temperature, perhaps previously subnormal, has

again risen and is higher than at the onset of symptoms. By this time the progressive march of all symptoms can be noted from hour to hour. All evidence points to increasing infection and the general condition is going from bad to worse. While late, it is not yet too late to hope that with operation some of such cases will recover.

DIAGNOSIS

The diagnosis of perforation is difficult. It is seldom easily made. It is more commonly made after careful exclusion of other complications; in a few cases (probably about 10 per cent.) it is altogether overlooked or misinterpreted.

As valuable aids in the diagnosis the posting of rules governing the nursing of typhoid patients, such as suggested some years ago by Osler, MacKenzie and others, should be carried out. In hospital work these rules embrace the reporting to the resident of *any sudden change* in the condition of the patient.

The symptoms closely related to perforation are sudden abdominal pain, vomiting, chill, rapid change in the temperature or increase in the pulse or respiratory rate. Sweating and presence of blood in the stools. In private practice the same plan can practically be carried out. In either case, with the development of suspicious signs a surgeon should be associated with you to study the condition of the abdomen. In my own hospital work I make it a rule to have the surgeon notified immediately; frequent consultations have been of mutual advantage and have in recent years considerably reduced the percentage of error in the diagnosis.

In the practice of medicine it is well to take nothing for granted. It is, of course, a *sine qua non* that the primary diagnosis of typhoid fever should be established. In the emergency cases in large hospitals this is not always easy. Careful investigation as to the duration of illness will almost invariably reveal a history of malaise, cold, bowel trouble for ten days or longer. This should at once put us on our guard. Any history of blood in the stools or hemorrhage from the bowels almost settles the suspicion of typhoid. I have found the dryish, fissured tongue, the tendency to slowness and microtism in the pulse and the routine examination of the abdomen for spots and an enlarged spleen to be of untold value.

As a routine matter it is always wise to satisfy yourself about

the condition of the bladder, the presence or absence of tenderness or swelling over the femoral or iliac vessels and to examine rapidly yet with precision the bases of the lungs. Where the typhoid infection is mild, delirium absent and the abdomen flat and painless, the sudden onset of severe abdominal pain occurring during the third week, accompanied by a tender and rigid right abdomen (which is even flat and retracted, not distended), and by gradual increase in rate of pulse and respiration with increasing peritoneal aspect of countenance, the diagnosis of perforation is certain. Yet a routine examination will throw some of these cases into other groups. The following case can be called typical.

F. P., age 18, admitted to hospital with a mild typhoid of thirteen days' duration. At noon of the fifteenth day he complained of sudden severe abdominal pain. Was very tender on the right side of abdomen with rigidity of the right rectus and costal respiration. The liver dulness was completely obliterated. By 3.30 the leucocytes had risen to 17,500. There was but little change in the temperature or pulse. Perforation was diagnosed, operation done eight hours after first symptoms, the perforation in ileum discovered and sutured. There was free gas in the peritoneum and considerable fluid in the abdomen. The man made a good recovery.

About one-half of the cases have this abrupt, sudden onset and in some of them there is an undercurrent of continuous pain with the addition of the recurring paroxysm of severe pain.

When the infection is more severe, delirium more or less constant, meteorism present and vague abdominal discomfort complained of, diagnosis becomes fraught with difficulties, yet here again if the onset is sudden and, with the pain, an onward march of symptoms and physical signs is noticed, exploration should be done if examination shows no other factor capable of producing the above symptoms. The following case illustrates some of the difficulties.

J. H., age 16, admitted on the sixth day of typhoid. Mild nocturnal delirium was soon succeeded by higher temperature, constant delirium with subsultus, tremor and carphalugia. The leucocytes from the start were high, 10,100 on admission, on the eighteenth day 14,600, on the twentieth 15,700. Careful examina-

tion on the eighteenth and nineteenth days showed no evidence of complication except the presence of extreme toxæmia. He had become very thin, was constantly delirious but taking medicine and food well. The circulation was good, the lungs clear. During the night of the twentieth day of the disease the resident noticed a subtle change and the boy complained of some slight pain in abdomen the following morning at nine o'clock. Consultation with surgeon at 1 P.M. resulted in a decision against perforation. Slight abdominal rigidity was present with slight tenderness in the right lower quadrant, but no pain. Peristalsis was present. The breathing was costo-abdominal, the abdomen was slightly more distended than at 10 A.M. While the pulse and respirations were unaltered, the temperature gradually fell from 105 to 102. By 5.30 in the afternoon the abdomen was more distended, decidedly rigid, with tenderness over the bladder. The breathing was still costo-abdominal. The diagnosis of perforation was considered positive by this time. Operation showed a pinhead perforation in ileum with general peritonitis. The perforation had undoubtedly occurred during the night or in the early morning. The patient died of peritonitis thirty-four hours after operation.

When the infection is more severe and the pulse and respiration go from bad to worse, delirium constant, all evacuations involuntary and no abdominal symptoms present, the diagnosis becomes practically impossible, yet a certain percentage (10 to 12) of such cases are perforations, and from the condition of the abdomen at autopsy are probably several days old. In such cases the abdomen is usually neither rigid nor tender and other signs, such as chill, vomiting or temperature changes are lacking. The following case shows some of the difficulties presented.

D. M., admitted on the ninth day of typhoid and presenting in addition severe nephritis. Day by day he became more toxic. The temperature was not unusually high, but the increase in pulse and respiration rate was slow but persistent. Repeated examination of the abdomen showed no distention, tenderness or rigidity. No complaint of pain was made. He died on the twenty-third day of his disease, apparently from pulmonary cause. Perforation was not even suspected. Autopsy showed a general peritonitis and a perforation 2 mm. in diameter, 8 cm. above ileo-

cæcal valve. The peritonitis looked several days old. There was no attempt at closure of the perforation by adhesions or the omentum.

ADDITIONAL AIDS IN DIAGNOSIS

In a certain proportion (25 per cent.) of cases *chills* occur at the time or soon after perforation has occurred. The rigor may be severe and last twenty minutes to half an hour, or it may amount to a slight creepiness of a few moments' duration. It is well to recollect that chills may occur with the onset of many complications of typhoid fever, notably phlebitis, pneumonia and pleurisy, cholecystitis, after hemorrhage and sometimes from intensity of infection.

Vomiting is a symptom of importance in perforation, perhaps in one-fifth of the cases. It sometimes marks the onset of the perforation and continues throughout. I have known vomiting to continue a week before death released the patient, who refused operation. Autopsy showed perforation and a general peritonitis.

The Leucocyte Count.—The leucocyte count is interesting, but not of decided value. In a few cases a moderate leucocytosis can be demonstrated. In a much greater proportion but little change is found in the already existing leucopænia. Differential counting is not of sufficient value to be used as an aid.

The *blood-pressure* is usually raised in perforation, but some typical cases show no change whatever. I do not place great reliance upon it.

The *absence of liver dulness* or sudden change in its position is a valuable sign in cases where the previous abdominal signs have been featureless. In tympanitic cases the absence of liver dulness carries but little or no weight.

The Character of Breathing.—In some cases the costo-abdominal breathing is unaltered. In a large proportion of the cases the use of the diaphragm in breathing rapidly gives way to the costal type, and the movements of the abdomen are soon restricted, especially in the upper zones and on the right side of the abdomen.

DIFFERENTIAL DIAGNOSIS

The more common conditions with which perforation may be confused are:

1. *Retention of Urine and Cystitis*.—This is common in the toxic and delirious patients, though it may develop in any case. Retention is more frequent in men who have seldom been confined to bed. It is often associated with pain usually over the bladder, sometimes with chill. A globular tumor can at times be observed through the abdominal wall, readily palpated above the pubis and is dull on percussion. Catheterization frequently secures sixteen to twenty ounces of urine, after which the symptoms are relieved. In cystitis the urine is commonly turbid, retention may occur, urination is frequent and painful: retention with overflow is common.

2. *Meteorism*.—This at times, very difficult to differentiate from perforation. The onset is usually gradual and may be associated with increasing toxæmia. Distension is frequently confined to the colon, so that the lateral and upper portions of the abdomen are prominent. Perforative symptoms are much more common in the right zones. The pain of distention is usually dull and general, the pain of perforation more sudden and boring or peritoneal. The passage of a rectal tube will frequently relieve the symptoms of meteorism.

3. *Iliac and Femoral Thrombosis*.—Here there is usually local tenderness with subsequent swelling of the foot or leg. In iliac thrombosis the abdomen is frequently rigid with distinct local tenderness over the iliac vessels. Subjective pain is, however, not common. Femoral thrombosis is much more common upon the left side and the local pain and tenderness therefore left-sided. Perforation symptoms are usually on the right side. Chill frequently accompanies both conditions. In thrombosis the general condition of the patient settles down within a few hours and no further progress of symptoms is noted.

4. *Hemorrhage*.—Unassociated with perforation hemorrhage is readily detected, yet certain painful hemorrhagic cases cause one great anxiety. In large hemorrhage the temperature usually drops, the pulse becomes softer, smaller and more rapid, the blood tension falls and blood is sooner or later found in the stools. While the abdomen may be either retracted or distended, both rigidity and tenderness may be present, especially in the right iliac region, but no spontaneous or subjective pain is complained of. The slow

return to previous conditions is an important factor in your study. The sudden development of spontaneous pain should make one suspect an associated perforation. In the series of cases studied perforation occurred in association with hemorrhage in about eleven per cent. of the cases.

Experience, combined with judgment and most careful clinical observation, is needed in these cases: I have known a hemorrhagic case to have the abdomen opened, as a last resort to stop the constant loss of blood, and have a perforation discovered.

Let us hope in the next few years we may discover the *common* site of the bleeding, and in proper cases, get the surgeon to go in and check it as in any other variety of hemorrhage.

5. *Pneumonia and Pleurisy*.—Both may be ushered in with chill. In pleurisy the pain is usually referred to the axilla or costal margin. Abdominal rigidity may be extreme and persistent from the start, but excessive tenderness is not apt to be present. I count the most rigid, board-like abdomen of my experience those of pleurisy in typhoid fever. The presence of to and fro rubs over the axillary region should cause us to pause in our diagnosis and watch the developments for a few hours.

Pneumonia.—The secondary pneumonia of typhoid fever develops subtly, frequently with but few or no symptoms. The sputum may be absent and the change in pulse, respiration and the fever but slight. Careful percussion of the back is probably our most reliable sign in secondary pneumonia, coupled with rapid comparative auscultation. It is well to remember that in pneumonia the abdomen is frequently more rigid on the side in which the lung is affected, but not necessarily either painful or tender, though both symptoms may be present.

Other conditions have frequently been mistaken for perforation—cholecystitis, pericarditis, typhoid spine, appendicitis, etc., but only need be mentioned.

TREATMENT

If the diagnosis of perforation is made within reasonable time the only rational treatment of perforation is immediate operation. The question as to whether the perforation should be sutured and returned or an artificial anus formed—an operation advised by

Hayes of Pittsburg—is open to discussion. Rapidity is an important point. I have seen the operation completed in four minutes. It certainly should not take longer than twelve to fifteen minutes. If consent for operation is absolutely refused till your patient is practically moribund, it is well, if consent is then given, to refuse to interfere by operation. I have never seen such a case recover and it discredits good surgery to operate at this time.

My surgical confrères usually prefer ether for the anæsthetic; my personal preference is a local anæsthetic primarily, followed by ether, if needed. I have been further strengthened in this view by the study of the fatal cases, in which bronchopneumonia is extremely common.

In all cases the perforation should be searched for in a routine manner, *i.e.*, the localization of the ileocæcal valve and the examination of the ileum immediately above. I have seen ten to fifteen minutes wasted in searching the intestine in a haphazard way when the perforation was situated immediately above the cæcum.

The after-treatment of the cases for some time must be surgical; I am, however, distinctly opposed to the surgeon's placing the very toxic cases in the Fowler position. Starvation and constant enteroclysis are important factors for the first several days. The result of the operation, if the patient survives, is usually a distinct modification of the fever range. Relapse is not infrequent after operation (25 per cent.).

From our present statistics, we can expect one in four of our cases to recover; some individual operators can show better recovery percentages, but in general hospital work the average mortality is about 75 per cent.

In future years even this percentage will result in the saving of many lives in the state of Pennsylvania alone.

ON THE VALUE OF ŒSOPHAGOSCOPY FROM THE POINT OF DIAGNOSIS AND THERAPEUSIS

BY M. GUISEZ, M.D.

of Paris

UNTIL the last few years very little was known about the pathology of the œsophagus; but œsophagoscopy has now made it possible to see and to describe lesions that had previously been but little understood, and has introduced unquestioned progress into the methods of treatment of this organ.

Thanks to this means of direct examination, I have succeeded for my part in rectifying diagnoses made by ordinary clinical and radioscopy methods; and in a certain number of cases I have been able to prescribe a retinal treatment based on exact data and to cure certain patients, who have now resumed their ordinary life but who would have succumbed to hunger and cachexia without œsophagoscopy. Formerly an artificial opening into the stomach would have been their only resource.

It has been my desire to wait until it might be possible, through the repetition of similar cases, for me to publish some positive data and to deduce a certain number of general ideas as regards this new method; the following remarks, then, are a brief résumé of the experience of several years.

In the first place there is one point that should be well understood: œsophagoscopy is neither a dangerous nor a painful method. I might cite my personal experience that is now based on a daily use of the œsophagoscope for several years, and advance as an argument that I have never had any mishaps; but it will probably answer the purpose better to prove that there is no danger in using this method for *any one* who knows how to handle the instruments. Of course the introduction of the œsophagoscope must be performed according to certain very precise rules, which can only be learned by practice and must be strictly applied.

What might be the dangers connected with œsophagoscopy?

1. Lesion of the walls of the œsophagus, which are often very friable in the pathological state.

2. Rupture of a liquid pouch pressing on the œsophagus and closing it up, as in aneurysm.

When the reader has grasped certain points concerning the physiology of the œsophagus, and of its exploration by means of the œsophagoscope, it will become evident that these accidents are impossible. We were taught in our text-books to consider the œsophagus as a tube of more or less even calibre, narrowed at two or three points (cardia, aorta and bronchi); this, however, is only its condition in the cadaver.

Œsophagoscopy shows us that on the living subject the œsophagus is not a tube but a *cavity*, in the greater part of its extent, only for three or four centimetres of its upper portion and for two or three at its lower end, do its walls meet each other; the remainder forms a spindle-shaped cavity that is always open. The adhesions of the œsophagus to the neighboring organs, and the intrathoracic vacuum, which acts not only on the thoracic portion but also on the lower cervical part, cause the œsophagus to form a cavity, whose dimensions vary according to the subject, but which is always present, and whose walls are the seat of incessant movements following the rhythm of the breathing and circulation.

When the interior of this cavity is examined through the tube, the field of vision is quite extensive. As soon as the cervical region is passed, the cardia can be perceived seven or eight centimetres beyond the end of the tube. Furthermore, as the distal end of the tube can move within the cavity of the œsophagus, the different portions of its walls can be successively examined without being touched. It is therefore evident that even when the wall of the œsophagus is diseased it is not possible to damage it, if the tube be advanced carefully under the guidance of the eye.

In this way I have examined cancers of the wall of the œsophagus that had ulcerated a large portion of their surface, and cases of aortic aneurysm projecting into the duct; it was always possible to make the diagnosis at a distance, keeping the tube several centimetres away from the dangerous region.

There remains, therefore, the exploration of the two extremities, the upper orifice and the cardia. I have always found, as has

also Killian, that the cardia is tightly closed, in spite of what is stated by text-books. There is an actual sphincter muscle between the œsophagus and stomach. The cardiac end appears in the œsophagoscope more or less like a tightly pleated funnel. It can be examined from a distance, as it forms the bottom of the spindle-shaped cavity mentioned above. A local application of cocaine abolishes its tonicity, so that it can be explored in all its portions.

The upper orifice of the œsophagus, examined on a patient with the head thrown back, appears, when the epiglottis does not fall over it, in the form of a simple transverse line behind the arytenoids and in front of the vertebral column. This orifice is therefore tightly closed. There exists in this region at the entrance to the œsophagus a species of sphincter muscle consisting of the lower portion of the lower constricting muscles of the pharynx and of the upper portion of the annular fibres of the œsophagus, which keep this orifice tightly closed. This is what Killian has called the mouth of the œsophagus, with an anterior and posterior labium, and which opens slightly during certain efforts in speaking, or when the larynx is drawn forward. This orifice seems *a priori* impenetrable, and the œsophagus would appear to be very well guarded. Nothing but the food, giving rise to movements of deglutition, can get through it with ease.

I have overcome this sphincter action by means of the supple bougies adapted to my instruments; they pass through the sphincter with facility and without risk. When the tube is placed in the pharynx and the head of the patient well thrown back, the orifice of the œsophagus is seen; then, applying cocaine to the sphincter the supple director is inserted, and easily made to pass into the œsophagus. The tube is, so to speak, swallowed by the œsophagus, and the most troublesome step in œsophagoscopy is over; the dilated portion of the cavity is next quickly reached.

The first portion of the œsophagus, where alone the walls of the tube come closely together, is the only place where there might be any question of making a mistake; but this can be easily avoided by following the instructions given above. In no other portion of the tube can any harm be done, provided the operation is carried out in exactly the manner described. It would be quite

unjust to lay accidents that are nothing more than the fault of the operator to the door of the method itself.

Again, the method is not at all a painful one; in nine cases out of ten the examination can be readily carried out with no other anæsthetic than cocaine. With the use of the supple director the passage of the tube is no more disagreeable than that of an ordinary stomach tube, where anæsthesia is never used.

The element pain, as every one knows, varies according to the nervous system of each patient; there are persons with whom the use of the laryngoscopic mirror sets up the most distressing reflex movements, just as there are certain women in whom the condition of the vagina is such that a mere examination with the speculum is impossible. Exceptional cases should therefore not be taken into account in laying down general rules; in such unusual instances recourse can always be had to chloroform. Œsophagoscopy is no more trying to the patient than any other similar method of examination,—rectoscopy, urethroscopy, or cystoscopy. But in any event, such drawbacks are outweighed by the advantages to be derived from this method of examination, and should arouse no hesitation in a physician who has at heart the welfare of his patient.

As regards *diagnosis*, œsophagoscopy is the only method of exploration now in use that renders it possible to ascertain the exact position of an obstacle, or that supplies us with reliable information concerning the condition of the walls of the œsophagus. The methods of diagnosis in use hitherto, in ascertaining the position of an organic or spasmodic stricture, have depended upon the use of the catheter and the radiosopic bismuth test. Now the catheter, as well as the bismuth, is brought to a stop by spasmodic rings, which, in the case of organic lesions, always coincide with, and precede and hide, the actual stricture. When we examine with the œsophagoscope a patient with cancerous stricture of the cardia, it is common to detect a spasmodic ring four or five centimetres above the real stricture. This is where the catheters and bismuth introduced into the œsophagus are stopped; and the ring only gives way under the direct and local action of cocaine. In many instances I myself have been deceived for a time by this endoscopic appearance, and have taken the case for one of simple spasm; but

finally the ring has opened, and revealed below the ulceration, the real cause of the obstacle.

This fact had already been noted by some former observers, and cases of spasm of the upper portion of the œsophagus, dependent on cancer of the lower third of this tube, were reported to the medical societies. These spasmodic rings may be manifold, occurring at the orifice of the œsophagus, or even at the cardia, in carcinoma of the middle portion. The patient, whose apparent trouble consists in this spasm, is inclined to localize the disorder at that spot, and the information which he gives helps to mislead the physician in his diagnosis.

Œsophagoscopy is also the only means of ascertaining the true position of a foreign body in the œsophagus; it enables us to determine the exact point at which it is lodged. The account given by the patient is often vague. The X-rays are not obstructed by all foreign bodies, and even in cases where a shadow is thrown on the screen there may be causes of error. The œsophagus is the seat of incessant movements of deglutition, and a foreign body may, after radiography, change its position and move down towards the stomach. The spasm, which is the principle means by which the foreign body is held in place, may yield, and allow the latter to descend and pass out of the œsophagus. On two occasions I have removed foreign bodies from the neighborhood of the cardia, when both radioscopy test and the patient's sensations indicated that the foreign body had lodged in the cervical portion of the œsophagus; it is not unfair to ask what would have been the result of a surgical intervention on this cervical portion in these cases!

In addition to this, it is sometimes impossible to decide whether a foreign body is in the œsophagus or in the trachea; when it is lodged in the upper part of the œsophagus it gives rise, especially in children, to such intense dyspnoea that the diagnosis may be very difficult. I had occasion to remove, with the œsophagoscope, two years ago a one franc piece from the upper part of the œsophagus, in a child that showed such marked symptoms of suffocation that tracheotomy seemed almost imperative.

On another occasion I was called to one of the hospitals to examine a child whose history showed how difficult it may be to make

a correct diagnosis in an obscure case, no matter how carefully the latter may have been studied. A child swallowed a safety-pin, began to choke, and was sent to the hospital. Laryngoscopic examination showed nothing unusual in either pharynx or larynx, but radiography revealed the pin at about the middle of the neck. At a certain moment the dyspnoea increased to such a point that tracheotomy was deemed inevitable, although careful searching that had been made with a forceps through an opening failed to reveal any foreign body. Radiography was repeated the following day, and to the astonishment of everybody the pin was detected near the tenth dorsal vertebra, that is to say, in the intestines! It had manifestly been in the œsophagus, and had given rise to these very deceptive signs of suffocation. In such cases it is certain that nothing but œsophagoscopy, or tracheoscopy, is capable of establishing the diagnosis, of avoiding a useless operation, and of enabling extraction to be performed on the spot.

I shall only say a few words here concerning the advantages of this method in diagnosing congenital cicatricial strictures; it is the only method whereby they can be localized and their nature and degree determined, and whereby a rational treatment can be undertaken.

As regards parietal lesions of the œsophagus, we have here the most perfect means of diagnosis that exists. Since I have been receiving a larger number of patients for examination, I have found that although spontaneous stricture is often a synonym for cancer, particularly in old people, such a diagnosis is erroneous in at least one case out of every ten. Thus in ten cases out of 160 patients sent with a probable diagnosis of cancer, the disorder was simply spasmodic. Such an error in diagnosis may risk the death of the patient from inanition, because the use of the catheter is feared in the presence of a cancer,—their only relief being gastrostomy.

The case of an aged physician which I have recently studied, with salivation, cachectic appearance, fetid regurgitation, and great loss of flesh, is particularly instructive, as there seemed every ground for assuming in his case the existence of a cancer; but direct examination with the tube showed that there was no parietal lesion at all, and that the trouble was spasmodic. He has now regained his appearance and weight, with the help of a very simple treatment.

A spasmodic ring is rarely isolated, that is to say, when there is spasm of the cardia there is always at the same time spasm of the entrance of the œsophagus. In four cases a so-called idiopathic spasm appeared to depend on a slight lesion of the mucous membrane; I detected, hidden away in its folds, a little fissure, of elongated form, and with swollen edges. By cauterizing these fissures with nitrate of silver, and dilating the region progressively and methodically, these cases were cured.

Cancer of the œsophagus reveals itself under direct examination by a group of symptoms that leave no doubt as to its nature. In its earliest stages the wall of the œsophagus is infiltrated and immobilized by white patches of leucoplasia; later on, the granulating surface bleeds at the slightest touch, and is covered with thick, fetid, purulent discharge.

Several cases, sent with the diagnosis of cancer, proved to be aneurysms. The trouble in swallowing was due to compression of the œsophagus by the pouch of the aortic tumor. The wall of the œsophagus, compressed by such a pouch, is smooth, and projects into the cavity of the œsophagus; and at that point it is possible to see a definite pulsation, and a species of quivering that is very different from the normal movements of the œsophagus. These tumors should be looked at from a distance, as their wall is sometimes torn with great ease. In seven instances the œsophagoscope alone cleared up the diagnosis, which was confirmed later by other symptoms, radiography, or postmortem examination.

The method has furthermore rendered marked progress possible in the treatment of conditions formerly deemed incurable. One of the most successful applications of the œsophagoscope consists in relieving cicatricial and congenital stricture; in sixteen cases where it had been found impossible to pass anything through the stricture, the patients were cured and can now be fed in a normal manner.

In cases of idiopathic spasm of the cardia I have been able to dilate the ring with large bougies after having made a slight incision of the tissues with the œsophagotome; and several patients have thus been enabled to take a sufficient amount of food. It is evident that without the œsophagoscope, which gave

me the certainty that there was no parietal lesion, I should never have ventured on such a line of treatment.

When the spasm is due to fissure, the treatment is tedious, but must be continued as long as any pouch remains above the stricture; all of the cases treated by me in this way were followed by recovery. One patient in particular, seen in a condition of advanced cachexia, undoubtedly owes her life to the Œsophagoscope, which rendered an exact diagnosis possible; direct local treatment (dilatation, after scarification of the sphincter of the Œsophagus) was followed by extraordinary improvement, and later on applications of high-frequency currents completed what had been begun.

Œsophagoscopy throws therefore an entirely new light on the pathology of the Œsophagus; it does not pretend to exclude the other means of diagnosis, but to act as their complement. Its latest step in advance in this department is the relief of lesions which were formerly considered incurable (spasm, idiopathic dilatation, and impassible congenital cicatricial strictures). It is a harmless method, provided that the precise rules enumerated above are followed to the letter; otherwise accidents will occur with this as with any form of endoscopic exploration.

CONSIDERATIONS AS TO THE NATURE OF HYSTERIA, WITH THEIR APPLICATION TO THE TREATMENT OF A CASE

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THE distinguished clinician Lesègue¹ not only felt himself unfit to define hysteria, but was rash enough to state publicly that "the definition has never been given and never will be." It is to this lack of definition that must be attributed the confusion medical men have felt when speaking of hysteria. Not one of the group of symptoms known as hysteria was regarded as characteristic, and hence a comprehensive formula seemed out of the question.

What more unlike than the stigmata, with their fixity and subconscious origin, such as the pharyngeal anæsthesia, the general hemi-anæsthesia, stocking or glove anæsthesia, the involvement of the special senses, the contraction of the visual field with dischromatopsia affecting chiefly the blue and violet, the monocular polyopia, the hysterogenetic zones, the clavus and the ball? Among the stigmata, Bernheim² numbers also the palsies and contractions, though some authors include these in the accidents and attacks, in which they number also aphonia, mutism, stammering, polypncea, the ball, hiccough, vomiting, tympanitis, pseudoangina, polykuria, chorea, tics, coxalgias and the various vasomotor symptoms of alleged hysterical nature.

Many of these can be included only because of this lack of definition of what is meant by hysteria. They were often due to an organic condition which was unascertained because the clinician, as soon as he found neurotic symptoms, immediately looked for the stigmata; and on finding one, at once jumped to the conclusion that the whole trouble was hysterical. It is not difficult to imagine how in this way numerous symptoms were added to this category, already so huge, and how it became nearly impossible rationally to

interpret them all in conformity with any one pathological process; for in this group have been described such different affections as oculomotor palsy, abducens spasm or palsy, spinal paraplegia, muculospiral nerve palsy, photomotor palsy, with or without anisocoria, and mydriasis, abolition of the reflexes, erythema and blue œdema, bullæ, ulceration and even gangrene, pulmonary congestion, hæmoptysis, hæmaturia, incontinence and retention, and that much discussed phenomenon hysterical pyrexia.

I have cited only the more conspicuous of the symptoms which have been described as hysterical. Can it be wondered at that hysteria was called the "grand simulator" producing any symptom whatever; and as that which means all means nothing, that the ideas concerning it were as vague as the word itself.

Rejecting then those symptoms which may have been included by errors of this kind, let me examine first the stigmata, which Bernheim excludes from what he understands by hysteria. But as I hope to show, this exception of Bernheim depends upon difference in the use of the term; for he excepts them only on the ground that they are usually the product of a suggestion by the physician who examines the patient. He denies their autochthonicity. In a sense, this must be true; for all suggestion must be primitively heterochthonous, though it may ultimately arise from a subconscious ideational complex of the patient's self. The importance of avoiding this source of error from unskilful questioning of the patient has been pointed out elsewhere by the author,³ as well as by Bernheim,⁴ Babinaki,⁵ Dejerine.⁶ The patient should never be examined in the presence of similar cases; possible symptoms should not be spoken of before them; for even during an attack the patient is not so unimpressionable as it seems. Nor is it wise to ask such leading questions as "does one side feel as well as the other"? or, "can you feel this"? "Is this hot or cold"? especially with the air of pleased expectancy which the novice often exhibits, more especially when for the first time he believes himself on the eve of observing some symptom long read of in the "authorities."

The usual way of examining the field of vision is also defective in this respect, for it must be remembered that the visual acuity diminishes towards the retinal periphery, indeed disappearing for

color; red, appearing black when seen against white, and green seeming white when viewed upon a dark background. Babinski⁷ among over a hundred patients, all unequivocal hysterics presenting the convulsive attacks, has during ten years never found either anæsthesia or contracted visual fields to white or color in any patient who had not been examined previously by a physician. Bernheim's⁸ 15 years' experience lead him to the same conclusion. Thus the alleged autochthonicity of these symptoms seems to disappear.

Camboe⁹ shows how patients simulate gravel; and Cestan and Nogues¹⁰ report a remarkable case where œdema of the hand, rapidly cured by incision, was followed some months later by metacarpal osteomyelitis. Some months after, the knee-joint was severely disabled, and the X-ray detected numerous needles within it. The rôle of trickery in the production of cutaneous eruptions, ulcerations, and hemorrhages is discovered in proportion to the completeness of the inquiry. Lannois'¹¹ case is a striking example, where a girl pretended to tell the color of objects placed on the skin. As long as the test was done with coins she was successful; but when specially made metallic plates were used, her answers were at hap-hazard. An examination compelled her to confess that she had developed the power of distinguishing coins placed on the skin, and hence of telling their color to the satisfaction of a medical hypnotizer who was experimenting with her.

Terrien¹² has shown how often inquiry discloses a relative or neighbor who has presented similar symptoms to those which the patient copies. Epidemics of appendicitis in women's colleges are significant in this connection. Hysterical gastropathies are exceedingly common, but too rarely diagnosed by the devotees of stomach chemistry, who indeed are often responsible for their perpetuation as has been so brilliantly demonstrated by Dejerine,¹³ and Mathieu and Roux.¹⁴

The myosis or mydriasis of alleged hysterical origin proceeds from an undetected organic affection or from a desire to deceive, as in the case of a young girl observed by me in Babinski's clinic, in whom for six months one or other pupil was constantly dilated. No one in the family was using mydriatics, but upon close inquiry, the girl admitted that the manageress of the laundry in which she

worked had been using eye drops, which however she declared she had never seen. A little management of the conversation disclosed the fact that on one occasion she had replaced the bottle after seeing her mistress leave it on a bureau. The demonstration was completed by sending for the prescription, which was found to contain sulphate of atropine. It need hardly be added that there was no more hysterical mydriasis. The instructiveness of this case consists in the emphatic denial of the patient's father that she could *possibly* have had access to any drug.

The case of Talamon et Lácorché¹⁵ should warn us from attributing phenomena we cannot explain too rapidly to hysteria. It was that of a woman of 69, who presented from time to time œdema and purpuric patches scattered over the legs which disappeared in a few days. This happened to be frankly a paralysis agitans as was the case of Carrière,¹⁶ a woman of 60, who showed ecchymoses of various sizes in the interosseous space of each hand. The pathogenesis of these was verified at an autopsy, where the cells in the columns of Clark were found diseased at the corresponding level, as well as certain fibres in the upper extremities. An arteriosclerosis seemed to be the etiological factor.

A case recently reported by Bernheim¹⁷ is a remarkable illustration of this point. It is that of a woman sent to him for symptoms of hysteria consisting chiefly of crises. Naturally in his hands no anæsthesia nor restricted visual field showed themselves. Four months later amaurosis developed, accompanied by headaches, and examination showed œdematous optic papillæ. Incoördination soon developed, and the diagnosis of cerebellar tumor was established.

Such instances might be multiplied indefinitely; suffice it to say that in a most careful search among all the hospitals of Paris during a period of six months, and an investigation of all the available cases within the memory of the visiting physicians now living, not one tenable instance of hemorrhage or other vasomotor manifestation was found by Mendicini Bono¹⁸ to be hysterical in nature.

An emotional crisis is not necessarily hysterical, *e.g.*, sitting or standing too long in one posture tends to produce stasis, and this causes a state of distress, which is relieved by movement." It is

true, however, that an emotional crisis once constituted in this way may be perpetuated by suggestion as in the following case: The patient every month since her first period at the age of thirteen, had crises of sudden onset preceded by feelings of malaise, lasting ten minutes (at the commencement of the periods). This alarmed her and produced a crisis of fear, emotion being otherwise uninfluential. There was complete amnesia.

A condition not to be confused with true hysteria is that in which syncopal attacks occur, whether epileptic in nature or not, preceded by the epigastric sensation. These attacks, in certain respects, resemble the paroxysms in the *angstneurosis*, though the latter are often referred to an idea which conveys emotion. They in no way partake of the nature of hysteria. Patients of this character never develop functional palsies, contractures, anæsthesiæ or other stigmata, and yet how often are they not labelled hysterical, the connotation intended being in reality, emotional, a very different attribute as we shall see. That emotion may be suggested just as are ideas and acts, is probable; and an emotional manifestation thus induced comes of course within the definition of hysteria. This is very different from calling all emotions by that name. We do not refer all types of tachycardia to a cardiac lesion nor all varieties of orthopnoea, to disease of the lungs. We do not even refer to all insanity by one term; and it is no more reasonable to stamp all abnormal emotions as hysterical.

Considering then only those cases which all clinicians save Bernheim agree to be hysterical, it is evident that if such various manifestations as attacks, paralyses, contractures, anæsthesiæ do really form a group, there must be a character or characters common to them all. If so, this character is susceptible of definition; and its nature may then be sought.

Now the character of "production and disappearance under the influence of suggestion" is one possessed by certain contractures, certain paralyses, certain anæsthesiæ and certain convulsive attacks, that is to say, a common pathogenesis is at the base of each of these outwardly different manifestations. Thus a definition is constituted; for this origin is at the bottom of all; and there does not exist another condition where a similar origin can be legitimately invoked.

The definition is then correct; but it does not follow that it is complete; for there may exist some other distinctive character common to the manifestations in question. But no one has yet stated any such distinctive character, if we except such psychological attempts as the "failure of representation" of Moebius,¹⁹ or the "defect of mental synthesis" or "contraction of consciousness" by Janet,²⁰ or the physiological supposition that hysteria arises from a numbing of the cortical centres (Sollier).²¹ The former of these deals with psychological inferences which cannot be demonstrated, and are not definitions but explanations, and moreover do not satisfy all the facts; while the latter is a pure assumption; and though it may be true, has not been so proven.

These theories being dismissed, it fails to consider whence comes this suggestion which is at the root of hysterical symptoms. If it concerns a matter not known to the laity, it would appear to proceed from a medical source, even though this may not be recognized at the time. An instance will show how delay may mask the etiology.

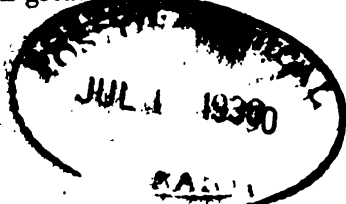
A girl was brought to Babinski having become monoplegic upon receiving an electric shock while crossing a tramway line. This seemed like paralysis not caused by suggestion; but after the symptom had been removed by persuasion, further inquiry elicited the fact that the patient had overheard some months previously a conversation between some electricians who were speaking of the dangers arising from electric shocks of the above description. It is evident that upon experiencing the shock, there had flashed into the patient's mind a datum learnt from the conversation she had overheard and apparently forgotten; and that this memory furnished the suggestion at the base of the palsy she developed. Another case traceable to buried causes was one reported by Raimist²² where retention of urine in a Jewish boy was traced to efforts one year before to retain his urine and fæces while hiding in a barrel during the massacres in Russia.

Remarkable instances of suggestion in dreams are those cited by Charcot²³ and Féré,²⁴ and that of Pitres,²⁵ where the hyperalgesic zones occurred at spots where the patient dreamed she had been touched by a witch. That this explanation is correct is proved by Morly-Vold²⁶ who could provoke definite dreams

through varying the site and character of sensitivo-sensorial stimulation. Similarly the Marquis de St. Denis²⁷ in 1867 showed that by voluntarily altering the intellectual stimulus before going to sleep, he could direct his dreams into any channel he wished, and in this way control the emotions experienced during sleep.

Modern psychiatry has shown how the most complicated intellectual processes are invariably accompanied by feeling tone, and that feeling tone in its turn has an accompanying intellectual character. Now in sleep, the latter faculty is largely in abeyance, and the mind is in a condition to receive the implantation and organization of a system of ideas conformable to the dread or other emotional state which has originated the course of thought which eventuates in the hysterical symptom the patient manifests on waking up. Persistent inattention to the coördination of mental impressions easily leads to an exaggeration of this tendency, which all of us possess more or less in a proportion that is inverse to precision of thought. One of the main objects of education is to rid the child of this primitive hysterisability. When this has not been done by the more or less rule-of-thumb methods at present in vogue, the so-called psychotherapy devolves upon the medical man who is consulted regarding the physical symptoms which may have ensued. These symptoms can easily be removed by suggestion; but this is a very small part of what is required, i.e., the removal of the inconvenience of symptoms in the future. I refer not to the physical but to the mental symptoms, which are a constant source of annoyance to both patient and associates.

All of us convey thoughts often quite unconsciously by gestures, facial expressions, tricks of speech, and tones of voice. From these expressions, those who observe them often derive impressions; but as they are, so to speak, beneath the surface of the subject in hand, they are not noticed to any extent by observers whose minds are taken up with what appears more important or appeals to the constructive intelligence. But to certain orders of mind, especially those incapable of complicated mental synthesis, the intellectual elements of intercourse make no appeal. The attention of such persons is restricted, animal like, to that which it is capable of perceiving; and thus that which another would not perceive is noticed with great facility.



Now suggestibility depends upon just such a lack of the synthetic and critical quality of the mind; and the hysterical person, too indolent to make an effort at synthesis, and too aboulie to inhibit an impression once formed, perceiving the externals only of intercourse and feeling rather than formulating, acts upon the sense of knowledge thus engendered, from data not even within the cognizance of others. The fixed ideas of hysterics are often produced in this way, very often indeed by the inability of the physician to conceal that of which he himself is not conscious.

It is to this habit of mind that we must address ourselves; for the induction of a state of abstraction is in these cases only a matter of strength of disaggregating stimulus; and at any moment, in this condition or during sleep a stigma or accident may again be constituted.

The object of this re-education I cannot do better than state in the words of Duprat.²⁸ "To implant the habit of attention and study, to restrict the domain of credulity by developing the critical sense, to give practice to individual and independent reflection, to fortify the will, to create the habit of comparing disinterestedly one's motives for judging and believing; in a word, to teach a child to doubt and to will, to master himself, and hence to be free." The failure to accomplish this by the present scholastic education is most striking, as any one may see by talking with a teacher of the young. This want of power to synthesize perceptions is illustrated by the child's phrase "Our Father *thart* in heaven;" and by the fact that was related to me by the superintendent of music in the public schools of an American city who found the children incapable of visualizing the sound images of the words they sing or of attaching intellectual meaning to them. That this unfortunate tendency is fostered by present scholastic methods is shown by its comparative absence in very young children and its extreme prevalence in adolescents, as shown by the experience of teachers in medical schools, who find that it requires at least a year to accustom the students to use their senses for observation and to give again to them the habit of inquiry and investigation with which every child is born.

It is the type of mind which fails in such studies whose progressive indolence to will makes it a ready victim to hysteria;

whereas the habit of constant correction of one set of impressions by another set, derived either from previous experience or from immediate experiment, induces another salutary habit, viz., that of waiting when experience fails until that experiment can be performed which is the habit of suspension of judgment.

It is chiefly the shocks derived from sudden strong feeling which tend to disaggregate coördinating power; and it is just such strong feelings which most readily induce acts. It is only through its feeling tone that an idea can determine an act; so that if inhibitory power is not cultivated in the way just pointed out, any sudden impression inducing violent feeling may lead to an act absurd because not dictated by a harmonious co-relation with other experiences of the individual.

It is in this way that hysterics are so readily impressed by the sight of such diseased states as spasms, contractures, stammering, tics, coprolalia, etc. Great difficulty in diagnosis often arises from the way hysterics may simulate these conditions.

A few examples of medical training of hysterics will illustrate this argument.

1. Boy, of whom the doctor said "the first time no anæsthesia," the second time "he found a little patch after fifteen minutes." Then the father began asking after his son's sensibility; and the anæsthesia extended up the thigh.

2. A girl brought to Babinski (private) not having walked for two years on account of flaccid palsy. The doctor told how there had been no anæsthesia at first, but they examined more and more carefully and gradually found it, at first, a patch then gradually extending to whole limb. Babinski made her walk in three hours.

3. Case of woman of twenty-six with phthisis. Sudden frontal headache and fever, photophobia, and disassociated pulse and temperature. Lumbar puncture negative and non-curative. Then convergent strabismus of right eye; then retraction of the neck and Thierry's sign and retention of urine. Second lumbar puncture negative.

She had been a morphinomaniac, and had had appendicitis, pleurisy, and peritonitis in different hospitals. Three years before had hysterical meningitis, cured by one puncture, the fluid being

reported at high tension. Had previously simulated many varieties of tuberculosis; and after operation became dyspnoic with elevated temperature. Later imagined pleurisy and felt her heart to the right side of the sternum.

The present relapse of "meningitis" was cured when the temperature was taken by a nurse and demonstrated to the patient to be normal. This after the failure of an imaginary lumbar puncture.

When thoroughly studied, the hysterics that are apparently most spontaneous, are seen to spring from suggestions, *e.g.*, Conor²⁹ cites the case of soldier who was suddenly stricken by a paralysis of which the hysterical nature was quickly ascertained. It was disclosed on inquiry that his father had really been paralyzed in the same region; and that it was the sudden death of the latter which produced the violent suggestion of the similar paralysis in the son.

Similar suggestions, often latent for months or years, may always be unearthed by careful questioning, or in the hypnotic state, or by the psycho-analytic method so brilliantly used by Freud.³⁰ The patient is not so entirely unconscious of these memories as the school of the Salpêtrière formerly contended. It will be recollected that one of Janet's³¹ chief distinctions between hysterical fixed ideas and those in obsessive states depends upon the former not being within the patient's knowledge in the waking state at least. But that the patient is not so unconscious thereof as was formerly supposed, is shown even in some of Janet's own observations, as for instance in that of Marcelle cited in "*Névroses et Idées Fixes*" and that of George and Berthe in "*L'Etat Mentale des Hystériques*"; where a convulsion was caused by the perception of a hysterogenetic object by a part of the visual field which by the perimeter appeared anæsthetic.

The interpretation of some of Janet's cases in the light of these facts enables one to see how the exaggerated conformability of the hysteric, along with his ready appreciation of that which is required of him is the important factor to take into account in estimating whether or not the phenomenon is autochthonous.

Similar reasoning accounts for the contraction of the visual field in hysterics. Cases of true restriction of the visual field,

however, do exist; but these are in all probability suffering from other affections, most commonly dementia præcox, in which affection Blin³² and Pierce Clark³³ have demonstrated organic affections of the fundus oculi and restriction of the visual field. The analysis and further history of some of Janet's cases prove this. Cases 13 and 204, in Janet's "*Les Obsessions et le Psychasthenie*," are undoubtedly of this nature. Pascal³⁴ out of 75 dementia præcox patients, found that 32 had been considered neurasthenics for some time before admission.

Now though neurasthenia and hysteria are entirely different affections; yet there are even neurologists who persist in confounding them; while to the general practitioner, all the psychoneuroses are a vast terra-incognita which he does not seek to penetrate, satisfying himself with the name of neurasthenia.

This lazy inattentiveness eventuates very often in the "I don't know" of the hysteric. Now this "I don't know" must not be mistaken for a real amnesia any more than the failure to respond to sensory stimuli should be uncritically called an anæsthesia.

Philosophically speaking, people who have been permitted to grow up with this temperament are no more responsible for their acts than is a spoilt, naughty child for his. For that matter, no one is responsible according to deterministic doctrines; but sociologically and practically speaking all are responsible who are capable of telling right from wrong, and of restraining themselves from the latter. The matter of self-restraint depends upon two factors: First, the patient's own self-respect; secondly, the obligations towards, or the curb imposed by others.

These are tantamount to "*la suggestion du Milieu*" or the "imposition of the social consciousness" upon the individual. When this is attenuated or removed, weak willed or perverse people are as if rudderless; and will necessarily commit acts injurious to the body politic.

But the hysterical symptom is sometimes provoked directly by an organic insufficiency. Of such a creation is the astasia abasia of the tabetic, of the Parkinsonian, or the palsy due to trauma or even ensuing upon a simple rheumatic stiffness, or the hemianæsthesia superadded to all apoplectic hemiplegia, or the aphonia ensuing upon a laryngitis; or by muscular strain, as in the case

of Dejerine³⁵ where an attempted rape caused an adductor contracture of both thighs, or a nervous gastrodynia added to a slight dyspepsia, and so on. Indeed nothing is commoner than to find hysterical manifestations superadded to organic conditions. Bernheim³⁶ believes, and I heartily concur, that the neurasthenic state may engender and perpetuate certain hysteriform symptoms, curable by suggestion or persuasion. The cure of these then re-establishes the patient, who indeed was in reality no longer neurasthenic, but whose condition of ill health was kept up by the auto- or medical suggestion that he still was sick, and who is immediately re-established by appropriate treatment directed not to his neurasthenia, which the repose has cured, but to the implanted hysteria which has maintained his ailing state.

Pitres³⁷ cites striking examples of this in cases where surgical operation some time after injury to nerve trunks is immediately followed by recovery of sensibility, these being cases of residual hysteria, the sensibility having in reality recovered, but until the suggestion of a surgical operation, not being manifest to the patient.

A case where, however, suggestion is necessary or at least advisable is such a one as the following:

The patient, a girl, had had monoplegia. While in hospital was infected by hysterical crises by another patient, and on returning home began them. They occurred even in the street and in the omnibus; she fell and even hurt her nose but did not urinate or bite her tongue. They could be produced by suggestion, but persuasion failed to remove them. Then also hypnotism failed, but after the assertion, with successful result, that the crises were always producible on faradizing the neck, she easily believed that they could be made to disappear by compressure of the thumb. Thus the cure was effected. It was suggested to her that while the thumb was being compressed, even faradism could not cause a crisis. Later she herself compressed her thumb to arrest the crises. Another case is the following:

A girl came to Ballet's clinic on account of somnambulism, fits of anger, great fatiguability, loss of appetite, pains in head, arms, and back, following overwork. The family history was bad, and patient always had been constipated, respirations shallow. Patient had a stupid look.

Examination showed hemianæsthesia and restricted visual field. After admission by the writer, however, her examination showed total insensibility to pin prick on both arms, chest and face. Deep pressure was felt, generally allocheirically. In the face, pin prick was felt as a touch, and localization was uncertain. Cold appeared hot, except on right hand, where it was indifferent, and on the head. Stereognostic sense not impaired. Sensibility to touch conserved on head and legs. Sense of attitudes only slightly impaired. Allocheiria on abdomen. Reflexes all normal except right plantar which is feeble, and left conjunctival which is absent. Watch heard, but imperfectly, especially on the left. Visual field restricted especially superiorly. Taste and smell subjectively impaired only. Feels very fatigued after the fits and then has pricking sensations in feet and hands.

Since ten, has had absences, when something at which she was looking or to which she was listening disappeared. This was accompanied by a feeling of numbness in the head, and did not return until she shakes herself awake. At twelve, she fell down unconscious for 40 minutes, and had to be carried out of church. After this she had absences two or three times a week, and attacks of rage daily for two months. These are caused by an idea coming into her head that she must strike some one. "It is more strong than I." Sometimes she does not remember what has occurred during the attack. She confesses to have had rages with her parents and to have gone away in "flight," about which she forgot the details until the morrow, to forget them again the following day. Similar attacks occurred with the teacher at school when she was asked to do a task she had already done. She spoke rudely to the teacher, and fought her back when struck. The same thing occurred in her places, where she constantly fought her fellow servants, and even her mistress occasionally. Even in her second place, where she was so happy, she would have fits while alone, of throwing dishes about, with total amnesia afterwards, though she thought "I have not done right." During these childish flights, she would frequently pass half a day in the woods running wildly ahead, most of the time, and returning afterwards as if nothing had happened. She declares that she

forgot all the incidents except the presence of the trees and animals of the forest.

After the first treatment, by resisted movements, she could feel a prick on back of hand. The nature of the disease was explained. She was told to take cold baths, and always to move briskly, to practice an erect carriage, loosen her clothing, to breathe deeply, and when tired to rest. Mechanotherapy and the sensory stimuli were to be repeated frequently by herself. Repose from 11-12.30 was ordered. The suggestion was made in the waking state that she should not walk in her sleep that night. The following night however she walked, no suggestion having been given. She reported improved feeling after the exercises. Treatment and suggestion again given; and she did not walk the next night. The following day she had an attack of hysterical ball, became very stupid and refused her bath. Persuasion overcame this, and sensibility returned more rapidly in the afternoon.

During all this time she was on special light, anti-constipating diet which secured a movement after three days. The sensation was much better, but localization was imperfect. On fourth night she found her bed on the floor on waking, suggestion was made never to walk again.

Next day she was dull, heavy and discouraged, but was cured by ten minutes of respiratory exercise.

On the seventh day, she felt a plate hot for the first time; and believing herself well she wished to cease treatment.

She has had no impulsion to strike since the treatment commenced, but the right conjunctiva is still insensitive. She was allowed out, and the following day was again dull and slow. Exercises in writing were given. Menstruation occurred, and caused her to be sleepless and dull. She was sent to sleep by suggestion; and two days later she felt very well.

In the midst of the effort of writing her history, she felt something like a blow in the head; she indicated the frontal region on the right side. It was not in the skin but inside; it felt like a pricking. Immediately afterwards, her head felt clear, and she recalled the events easily. She was told these exercises were of a gymnastic nature to bring back her weakened mentality; so that she could later support the shocks and emotions of daily

life, from which she is protected for the time being. The sensibility had entirely returned, and she is doing far more work. On the 12th day she passed her station when returning on the metropolitan railway; she had a feeling of vague fear on doing so, followed by a chilliness and headache, and her exercises were not so good. Three days later, sense of position was impaired in left hand and arm. Hypnotism was commenced.

"You are in a dream?"

"Yes, sir."

"What do you dream?"

No answer.

"Do you dream of a man?"

"No."

"Of a woman."

"No."

"Of children."

"Yes."

"What are they doing?"

"Playing with toys."

"What exactly is happening?"

"They will not lend me their playthings."

"What are you doing?"

"I am beating them. I am very angry."

"What do you think about that?"

"I am sorry about it."

"Why?"

"Because I think I have done wrong."

The other children run away, and she goes home. Nothing more is said: next day all is right. She is aged 11, and they are her mother and sisters.

She was hypnotized again.

"You are a child?"

"Yes, sir."

"Where are you?"

"First day at school, fought the teacher all the time."

This lasted a month. Afterwards she liked the lessons.

The teacher was nasty.

After an interval—

"Where are you?"

"At school."

"How old?"

"Six."

The same fighting again; kicked the teacher; she showed me with her foot.

Again—"In the holidays."

"How old are you?"

"Ten."

She got into such rages that her parents had to send her to her aunt, where she behaved well.

It was suggested that she should sleep well and not dream.

She woke suddenly and spontaneously during the last conversation with the usual "distract," half sullen look.

That the suggestion not to dream was not hypnotic was shown by the remembrance of it and of nothing else.

"I do not feel at all as I used to."

Next day she told me "I did not dream last night after you told me."

She dreams of the dead. She saw her sister who died when she was four. Dreams of assassinations; saw a man assassinated at the age of 15. Dreams of wells; at age of six fell into a cellar, also into a hole and cut her face.

These dreams frighten her very much, she shakes with fear, perspires sometimes, gives herself a *shake* and the dream disappears (compare d'Hervey de St. Denys).

Of the death, she says it was annoying, she was too young to feel any more.

The sensibility, with occasional relapses, remained good after this. The rest of the treatment was directed towards the up-building of emotional control, which was begun before she had formed the hypnotism habit, the breaking of which tendency indeed gave the first opportunity. Force had sometimes to be used when persuasion failed. Suggestion was more and more dispensed with.

The ascendancy was soon transferred; and in 10 weeks she was, for the time being, cured and able to behave quite normally.

The discussion and the details of this will be entered into in its relation to the whole subject of psychotherapy. I need only

point out one great difference between the hysteric and the psychasthenic. The latter wishes and seeks for counsel, support, and direction; while the hysteric dislikes it at first, but becomes later an only too willing servant. It is against the danger of this that the psychotherapist must guard! for the "Fear of the Lord is *only the beginning of wisdom.*"

The ease with which the symptoms were made to disappear in this case shows the efficacy of skilfully conducted suggestion, for the graduated mechanotherapy is only a means of applying this treatment. But the length and difficulty of the treatment of the morale which ensued go to show that the removal of symptoms is but palliative, and that the true psychotherapy of hysteria consists in the uprooting of the habits of mind due to faulty education, and the replacement of these by a re-adjustment of the point of view, combined with practice in the acts required to implant it firmly among the habits of the individual. This cannot be done in a day; but its consideration, as I have said, must be left for a future occasion.

Removability by persuasion is the other criterion regarded as characteristic³⁷ of hysterical symptoms, persuasion as Babinski, Dubois³⁸ and Dejerine more particularly express it. The process they employ, however, does not appear to me to differ from that frankly called suggestion by Bernheim and others; for the distinction drawn by Babinski is the reasonableness, *in his mind*, of the idea imposed upon the patient. While not wishing to go so far as to define suggestion in the vulgar sense of an evil insinuation, yet he thinks that in medicine it should signify the notion of "trying to make another person accept or realize a manifestly unreasonable idea." For instance, to try and make some one in a dark room believe that he is surrounded by dazzling lights, is a suggestion; to insist that a healthy auditor is incapable of moving an arm, is also a suggestion; to create the belief in people suffering from physical inability that they are happy and whole, is also a suggestion. All these ideas are contradictory to the facts of the general experience of mankind, are irrational and false beliefs, delusions if you will. But on the other hand, Babinski³⁹ believes that he is using persuasion when he imposes upon a patient an idea which does not contradict rational experience; as for instance,

when he satisfies a patient that a psychic palsy of which he complains can be rapidly and readily removed by an effort of the will. This annihilation of the suggestion already present is, however, to my mind, nothing more than the substitution of a suggestion of false or evil tendency by a countersuggestion of true and benign nature. Psychologically, each of these is suggestion. Persuasion is of another order, and does not consist of the mere imposition of a belief, whether false or true.

Persuasion is not constituted by the truth of the matter or the correctness of the conclusion. Persuasion is not a result, but the method; and differs from suggestion by appealing to the individual's own power of reflection, which may lead to a belief entirely erroneous, without ceasing to be persuasion; while the imposition of an idea without exciting the critical faculty of the patient and without producing individual reflection, is a mere invoking of authority, in no way an appeal to the intelligence, and makes for a perpetuation of that very state of mind one of the symptoms of which it has so easily removed. An example will illustrate this: Two boys are given a complicated sum in arithmetic, one boy by applying what he learnt, reasons out a way of doing the calculation but through an oversight brings in an incorrect solution. The other boy by the application of an algebraic method which he has learnt by rote and does not understand, reaches a correct solution in a quarter of the time. Which of these boys will go the further intellectually speaking? Can any one doubt that it will be the former. His method is that which we seek to cultivate when we use persuasion, merely pointing out the omissions and assisting in the finding of data when required. The other boy uses the short cut to results, and appears for a time the more successful; but this success is short lived, resembling that of the young artists of whom the great Reynolds spoke in his discussion of the noble style of painting, when he told how they produced pseudomasterpieces while they were in the schools, and appeared to the uninitiated by far the most promising, but became afterwards painters of pot boilers, being incapable of further development. They had ripened before growing. The painter who really became great had studied each detail of every school, beginning at

the beginning, and not trying great flights until he had grown wings.

With this qualification then, that the individual symptoms of hysteria are also removable by suggestion, and substituting the word suggestion for persuasion, the doctrine of Babinski seems irrefragible. Similarly, the reconstruction of the imperfect mentality which permits of hysterical manifestations is a slow and painful process; each step is traversed with anguish and toil, which the physician cannot carry for the patient. It is in reality a re-education; and like all education, its value depends on the degree to which it is personal.

Hypnotism is merely the ultima thule of the mental state which permits of suggestion, a mark of extreme suggestibility; and differs from hysterical states only by its apparent need of external intervention for its production; but as autohypnosis is not very uncommon, the distinction has no validity, nor do its manifestations differ in any respect from those found in hysteria, which in turn are shown also to be in the main the result of hetero-suggestion. Even Bernheim² now adopts this point of view.

A minor ailment, such as pain, weakness, etc., often produces a temporary functional insufficiency, and such a relatively insignificant change unduly impresses the mind of the patient in its state of exaggerated susceptibility.

The disappearance of the symptoms during a simple isolation is perhaps due chiefly to the elimination of the injudicious sympathy of the patient's friends, as well as to the natural resiliency of the human organism. But the combination of this measure with psychotherapy not only makes a quicker recovery but a more radical one. It is to this fact that the success of the methods of Freud³⁰ and Ricklin is due.⁴⁰ Although I am not prepared to estimate whether the genital origin of hysteria is universal, as is stated; yet, the emotional influence of sexual perturbations is of far more importance than is willingly admitted by those students of the subject who approach it handicapped by an intellectual prudery or a moral *arrière pensée* quite out of place in a scientific discussion.

Within the category of emotional shock enters the so-called

traumatic neurosis, whether accompanied or not by serious injury. The same three factors again enter into play, viz., exalted suggestibility from the shock, the direct suggestibility of any local disturbance, and injudicious sympathy, which in these cases is frequently organized into the direct suggestion of a popular idea that such disorders are natural, inevitable, and beyond the power of the individual who professes them. The medico-legal abuses of this state of matters need not be insisted upon here, except that it is the duty of every intelligent neurologist so to enlighten his colleagues that this may no longer be a reproach to the body politic.

IN CONCLUSION

The very important diagnosis between hysteria and psychasthenia depends upon the following: First, as to fixed ideas, their duration in hysteria tends to be long; for though they are easily buried and forgotten, they are resuscitated with great ease and infallibility; whereas in the psychasthenic the fixed ideas are very mobile, but keep recurring voluntarily and indeed become cherished parts of the individual, and are far more difficult to eradicate than those of the hysteric. Secondly, hysterical ideas are evoked by well defined and not numerous associations, "suggestions"; in the psychasthenic they are often evoked by apparently irrelevant associations, which are searched for by the patient; thus the "points de repère" are very numerous, cannot be predicted with certainty, and are often mere excuses for crises of rumination or tics. Thirdly, in the hysteric, the ideas tend to become kinetic, whereas the psychasthenic's constant state of uncertainty causes him to oscillate between "I would" and "I would not." Inhibition is too strong to allow an act, but not strong enough to dismiss the obsession. The anorexia in hysterics derives from a simple idea not to eat, suggested by imitation, extraneously or in a dream. Cases of true loss of the feeling of hunger are not hysterical, but accord with the "*anorexie mentale*" of Lesàgue, in whose days hysteria was ill differentiated. The anorexia of the psychasthenic is secondary to an obsession, usually of shame of body, of being fat or of the act of eating, and is accompanied by numerous stigmata of the psychasthenic state.

We may then conclude:

1. That all the symptoms which may legitimately be included under hysteria are imposed by suggestion.
2. That the state of suggestibility comes from: (a) faulty education, tending to perpetuate and fortify the natural suggestibility of the child; (b) cerebral modifications due to organic causes the action of which necessarily varies among individuals in accordance with (c) the hereditary constitution.
3. Those symptoms which do not arise from this process do not properly belong to hysteria, but originate from causes which former observers had not ascertained.
4. The avoidance of medical suggestions, both primary and secondary, requires a vigorous technic for the examination of certain individuals.
5. The success of the treatment as judged by the permanence of its results strongly corroborates this view of the pathogenesis of hysteria.
6. A thorough and critical examination of the facts and a rejection of the fictions regarding hysteria thus brings us back, as far as practice is concerned, to the seemingly crude and naïve notions of the earlier observers, and involves the rejection of the dissociation theory as explicative of the pathogenesis of the symptoms of hysteria.

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THE CYTOLOGICAL EXAMINATION OF A CASE DIAGNOSTICATED CLINICALLY MALIGNANT DISEASE OF THE LIVER AND THE SPLEEN

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THE cytological examination of fluids removed from the serous cavities of the body is an important method of case study, which, if pursued systematically, may in the future be developed to such a point as to give evidence which will be of value in diagnosing individual cases. The published reports of such examinations are not yet numerous enough to render the announcement of the results of the examination of a single case superfluous, and the rarity of the cell picture in the case here recorded is excuse enough for publishing the clinical details without the confirmation of a necropsy, which was prevented by religious scruples.

The clinical diagnosis, which is warranted by the symptoms, was malignant growth of the liver and the spleen.

The patient was a girl, aged six years, who was admitted to the Children's Ward of the Polyclinic Hospital (No. 12113) in the service of Dr. Max J. Stern, on November 11, 1905. The patient's mother had noticed that the child's abdomen was increasing in size and that she was losing weight about one week before she was admitted to the hospital. The child was a well-nourished white child, without important family or personal antecedents, except an attack of bronchitis at the age of four years, and measles a short time before admission.

A week before the child was admitted she had had three or four attacks of epistaxis, and indeed, she had had similar attacks at infrequent intervals for a year. The child had also been coughing a good deal just previous to the development of the symptoms which

led to her admission to the hospital. Her appetite was good; her bowels were regular; she did not vomit; she had no expectoration; she had no convulsions; no pain; and she complained of no urinary difficulty, although at times she had had to get up once in the night to micturate.

The following notes were made by Dr. S. M. Hamill, who was asked to see the patient on December 1st.: "The eyelids have a puffy appearance and the eyes are rather prominent. The lids are dry and scaly. There has been some recent hemorrhage from the nose, and the anterior nares are poorly developed. The palate is high arched, and the child breathes through her mouth. There is general emaciation; the skin is loose and flabby. There is a scar on the inner surface of the right knee, which is said to have been due to injury. There is a moderate oedema of the legs, and the abdomen is very much enlarged. There is slight enlargement of the lymph-nodes at the angle of the jaw and of the posterior cervical group of lymph-nodes. The axillary lymph-nodes vary in size from that of a small pea to that of a large pea. The epitrochlears are not palpable; the inguinal nodes are as large as a split pea. The patient, by choice, lies on her back, with her legs and thighs extended and is uncomfortable in the sitting posture. The tongue is heavily coated, the teeth decayed, and the breath fetid.

Heart.—The apex beat is in the fifth interspace, in the mid-clavicular line; it is fairly forcible. There is no thrill. The cardiac dulness extends from the second rib to the fifth interspace, and from the right edge of the sternum to three-quarters of an inch outside the midclavicular line. In the recumbent posture there is a loud, prolonged, high-pitched, late systolic murmur at the apex, transmitted into the axilla and heard at the angle of the scapula. The pulmonary diastolic sound is rather less marked than normal. In the sitting posture there is a slight thrill at the apex, which appears to be due to the muscular action of the heart. The heart's action is accelerated, and the murmur is less distinct than in the recumbent position, while its maximum intensity is heard in the third interspace. There is a venous hum heard over the vessels of the neck on both sides, and over the inner portions of both clavicles. These signs disappear almost entirely when the child lies down.

Lungs.—Examination of the lungs shows no evidence of abnormal lesions. There is nothing to suggest pressure from enlarged bronchial lymph-nodes, and no dulness over the region of these structures.

Abdomen.—The abdomen is very much distended. The distention is symmetrical. The superficial veins are overfull; but there is no oedema of the abdominal wall. On palpation there is greater resistance in the right than in the left half of the abdomen. In the upper left quadrant there is a mass of considerable size, which has a distinct edge and notch suggestive of the spleen. It has an irregular surface suggestive of slightly elevated nodules, is quite firm, and freely movable. It extends three and one-quarter inches below the margin of the ribs in the anterior axillary line, and as far as the left midclavicular line to the right. The upper border of dulness begins at the seventh interspace in the mid-axillary line. The liver is palpable in the median line about one and one-half inches below the ensiform cartilage. To the right of this point, the edge of the liver cannot be definitely determined. There is something resembling a nodular mass just outside the mid-clavicular line, and one finger-breadth below the costal margin. There is greater resistance in the right upper quadrant than in the right lower quadrant. The kidneys cannot be palpated. With the assistant's hand placed in the middle of the abdomen and the examiner's hand placed in the flanks, distinct fluctuation can be elicited. On percussion there is marked dulness in the flanks, and tympany over the entire anterior surface. When the patient is in the sitting posture, the tympanitic note anteriorly is replaced by a dull note in the lower part of the abdomen. Superficial liver dulness begins about the seventh rib and seems to end just below the margin of the ribs."

Still later Dr. Hamill dictated the following description:

"EXAMINATION AFTER THE ABDOMEN HAD BEEN TAPPED.—The abdomen is much less distended although there is still considerable fluid present; the spleen is more readily palpable and the roughened surface described above is more distinctly felt. The edge of the liver can be felt in the right midclavicular line, about two finger-breadths below the costal margin. The nodule referred to above can now be distinctly felt and seems to be about the size

of a small walnut. Over the remaining palpable surface of the liver other masses of less size can be felt. The resistance described in the right upper quadrant is less evident and there are no palpable masses."

The following notes were made on December 4th by Dr. David Riesman, who was also asked to see the patient: "The patient is a well-nourished child with skin and mucous membranes of good color. The tongue is clean and moist. The abdomen is much distended so that it is considerably above the level of the chest, making the thorax flare out in its lower border. There is marked prominence of the veins of the chest and of the abdomen, especially in the flanks and the upper quadrants; there is less distention in the neighborhood of the umbilicus. The abdomen is elliptical and smooth; the umbilicus is flush with the skin. While the skin must be stretched, it does not look as though it were very tense. The chest is broad at the base; the costal angle is obtuse; the costal cartilages are prominent; there is no beading except at the right seventh costochondral articulation. There is no apparent dyspnoea; breathing is costo-abdominal. The flanks are overhanging. There is no glandular enlargement. There is some enlargement of the veins over the shoulders; there is no cyanosis of the face or of the extremities. There is some oedema of the legs, with decided pitting on pressure; there is distinct fluctuation of the abdomen. On percussion, there is distinct tympany from about two inches above the symphysis pubis to the ensiform cartilage, in the median line. Laterally, the tympany extends in the umbilical line on the right side almost to the back; on the left side to the prolonged left mid-clavicular line. When the patient is turned to the right the tympany disappears. When she sits up the whole lower abdomen becomes dull. There is a mass in the upper left quadrant, which can be felt a hand's breadth below the costal margin, which appears to be the spleen. The upper border of this mass is at the seventh rib. The spleen feels nodular. The liver dulness in the right midclavicular line, begins at the sixth interspace and extends to the costal margin. The apex beat of the heart is in the fifth interspace a little outside the midclavicular line. The right border is a little to the right of the midsternum. The upper border is at the third interspace. There is a soft systolic murmur heard all

over the chest, loudest in the third and fourth interspaces, heard faintly at the apex, and transmitted into the axilla. The pulmonary diastolic sound is accentuated. The cardiac murmur becomes louder after motion. There is a distinct systolic murmur audible over the liver, as far back as the midaxillary line; it is not audible over the spleen. There is no pulsation over the liver. There is marked pulsation of the vessels of the neck, including the veins; in the latter it appears to be a true pulsation. There is doubtful splashing on auscultation of the abdomen. The heart sounds are very loud in the back, but the murmur is not heard. The lungs are clear."

On admission, on the 29th of November, the child's temperature was 100.4°, her pulse 120, and her respirations 28. The abdomen measured twenty-nine inches at the level of the umbilicus. It increased progressively in size, until, on the 8th of December, it measured thirty-three inches. On that day 3620 cubic centimetres of a cloudy, straw-colored fluid were withdrawn under aseptic precautions without unfavorable symptoms. The circumference of the abdomen was reduced to twenty-six and one-half inches by this procedure.

After the operation there was almost constant oozing from the puncture, which kept the fluid from accumulating again to any great extent. There was always a slight febrile reaction, and eleven days later epistaxis, and oozing from the gums appeared. The following day an area of hemorrhage was discovered in the skin over the sacrum. The child then became delirious, then stuporous, and she finally died in coma on December 21, twenty-two days after admission. There was no autopsy allowed.

LABORATORY EXAMINATIONS.—*Urine.*—December 6, 1905. Color, yellowish-red. Reaction, acid. Specific gravity, 1022. Considerable cloudy sediment. Microscopic examination: Bladder and vaginal epithelium stained yellow with bile. Mucus, leucocytes, no casts. Bacteria. Chemical examination: Trace of albumin. No glucose. Bile present. Moderate amount of indican. Other examinations of the urine made from time to time by the resident physician on duty in the laboratory gave no further information.

Blood.—Examination made on December 5, 1905; three days before paracentesis abdominis: erythrocytes, 4,060,000; leucocytes,

11,920; ratio, 1:346+; hæmoglobin, 70 per cent. (Fleischl); color index, 0.85+. Differential count: polymorphonuclear neutrophiles, 70.2 per cent.; lymphocytes, 22.6 per cent.; large mononuclears and transitionals, 6.8 per cent.; basophiles, 0.4 per cent. The red cells, aside from slight anisocytosis, showed no pathological changes. Examination made on December 15, 1905, seven days after paracentesis: erythrocytes, 5,290,000; leucocytes, 19,600; ratio, 1:270—; hæmoglobin, 75 per cent. (Fleischl); color index, 0.72+. Differential count: polymorphonuclear neutrophiles, 73.0 per cent.; lymphocytes, 15.2 per cent.; large mononuclears and transitionals, 9.4 per cent.; basophiles, 0.4 per cent.; myelocytes, 2.0 per cent. The red cells, aside from slight anisocytosis, showed no pathological change.

Examination of the Ascitic Fluid.—Three thousand six hundred and twenty cubic centimetres of a straw-colored serum, containing no clot, submitted for examination. Reaction, alkaline; specific gravity, 1010. Albumin, 0.6 per cent. (Esbach). Glucose, absent. Bile absent. Urea, 0.1 per cent. Examined by inoscopy, no tubercle bacilli found. Cultures remained sterile.

A freshly drawn portion of the exudate was treated with an equal quantity of a 0.5 per cent. solution of sodium fluoride to prevent coagulation. This mixture was then centrifuged, the sediment was smeared on clean slides, in the usual manner, and subsequently stained with Wright's stain. Six varieties of cells were found in the stained specimen.

1. Round cells, about as large as lymphocytes with a solid, deeply stained, pyknotic nucleus, which fills nearly the entire cell. In some cells there appears to be no nucleus on account of the presence of basophilic granules so numerous and fine that they appear to be confluent.

2. Cells two or three times as large as a red blood corpuscle, which contain large, vesicular nuclei, in some cases with quite distinct chromatin filaments, in other cases with indistinct chromatin filaments, and a distinct nucleolus; sometimes more than one nucleolus. This nucleus, which is often excentric, is surrounded by a neutrophilic cytoplasm, and outside this cytoplasm there is a more or less complete rim of strongly basophilic substance. Sometimes this basophilic substance projects from the cell like a pseudo-

pod, and sometimes it entirely surrounds the circumference of the cell. There are all transitional stages between these two extremes.

3. Very large round cells with large vesicular nuclei, showing distinct chromatin network and pale staining nucleoli, and cytoplasm which is indistinctly neutrophilic, with or without a projection of degenerated basophilic substance, which contains vacuoles.

4. Cells like those described under 2 and 3 with double or triple nuclei, or nuclei which are constricted, no basophilic substance, and neutrophilic cytoplasm.

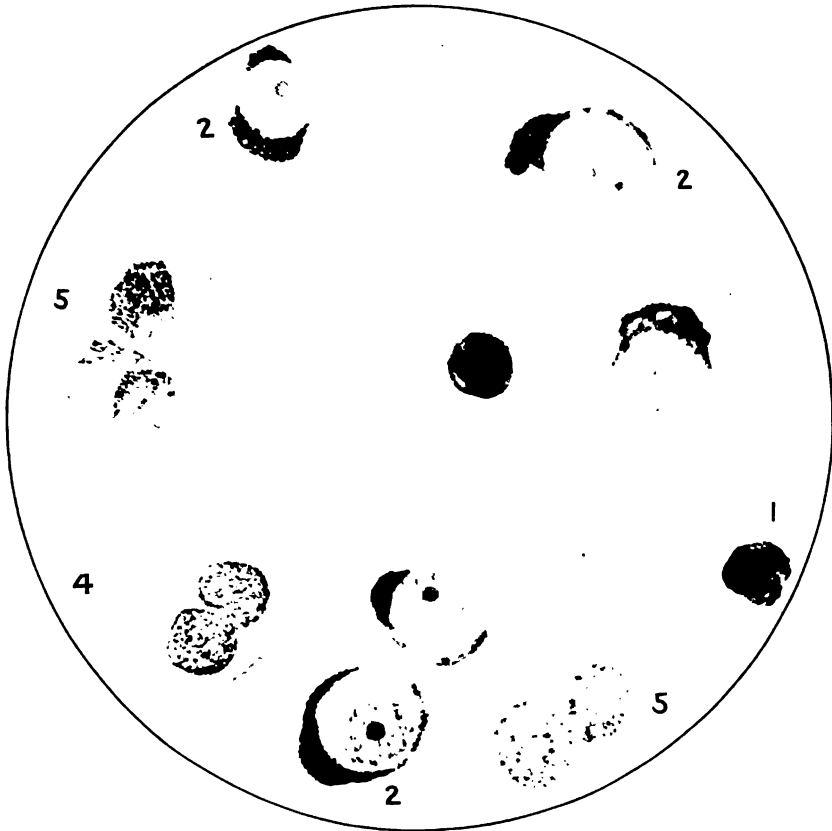
5. Cells like 2 or 3 with vacuoles in the nucleus or in both the nucleus and the cytoplasm.

6. Degenerated elements which contain vacuoles.

No elements were seen on numerous examinations in which karyokinetic figures could be made out; but numerous elements were seen which gave evidence that division was going on actively (Fig. 1). In counting 1000 of these cells there were 114 cells answering to the description of the first type, 11.4 per cent.; 276 answering to the description of the second type, 27.6 per cent.; 177 cells answering to the description of cells of the third type, 17.7 per cent.; 49 cells answering to the description of cells of the fourth type, 4.9 per cent.; 145 cells answering to the description of cells of the fifth type, 14.5 per cent.; and 239 cells answering to the description of cells of the sixth type, 23.9 per cent.

It is best not to draw conclusions from the examination of the sediment of the exudate removed from the peritoneal cavity in this case, on account of the absence of the positive evidence which would have been furnished by the necropsy. The temptation to interpret the cells found in the specimen is almost irresistible. I realize, however, that there would be many reasons for doubting the interpretation that the large uninuclear cells are tumor cells which are being engulfed by the basophilic elements, resembling lymphocytes, found in the specimen. On the other hand, similar objections might be raised to the interpretation that the peripheral portion on the cytoplasm of these cells had undergone basophilic degeneration. I am inclined to believe that the former supposition is correct, and that there was an active phagocytosis of the large tumor cells by the small basophilic cells that resembled lymphocytes

FIG. 1.



Type of cells from ascitic fluid.

so closely. Professor Allen J. Smith, to whom I showed the specimen, agreed in this opinion, and considered that the interpretation stated above was the correct one.

The case is presented in hope that some one else may have seen a similar sediment in a case which has been or can be followed to autopsy.

I am indebted to Dr. Max J. Stern for permission to report the case, and to Dr. S. M. Hamill and Dr. David Riesman for permission to use the notes dictated by them.

Surgery

MELANOTIC NEOPLASMS

WITH A REPORT OF CASES, INCLUDING ONE OF MELANOTIC SARCOMA OF RECTUM

BY JOHN H. GIBBON, M.D., AND DUNCAN L. DESPARD, M.D.
OF PHILADELPHIA

IN two of the three cases which furnish the basis of this communication the difficulty of classifying melanotic new growths is well illustrated, and it was with some hope of simplifying this classification that we determined on a careful study of the literature, especially that relating to melanotic moles. Success in this object, however, can hardly be claimed. It will probably remain a fact that these growths which often present the same clinical picture will continue to be described under various pathological terms.

Our third case is a typical melanotic sarcoma, occurring in the rectum, but the first and second cases, although presenting much the same clinical and macroscopical picture, apparently presented such microscopical differences as to make them appear like different growths. The similarity of the growths is well represented in the accompanying photographs, and the clinical histories also seem to confirm the idea that they belong to the same class of tumors.

Perhaps the discussion of the subject would be best opened by a detailed description of the cases.

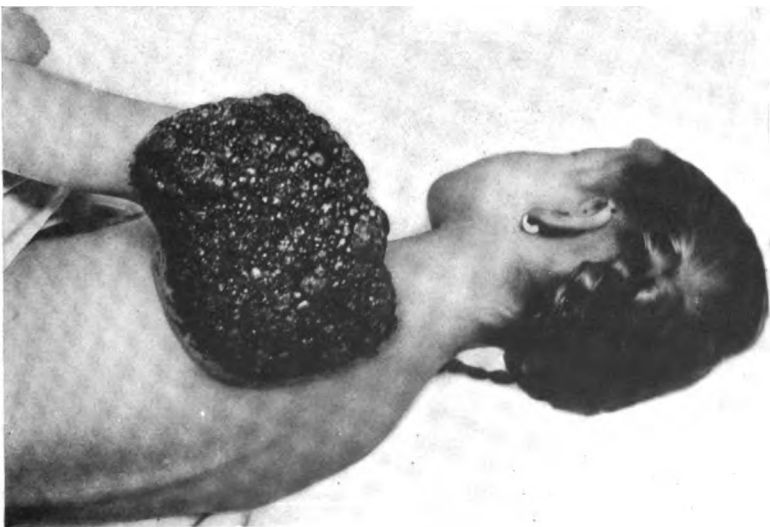
CASE I.—S. K., female, aged 7, a Russian by birth, was admitted to the Jefferson Medical College Hospital, March 5, 1907, and operated upon on March 9, 1907. The family history was free from malignant disease and was without bearing on the patient's present trouble. She had had the usual diseases of childhood, but was otherwise healthy and well nourished. At birth there was a smooth black elevated mole situated on the left shoulder posteriorly, its diameter at this time measuring about $1\frac{1}{2}$ inches. The tumor grew steadily, but in the four months previous to admis-

FIG. 1.



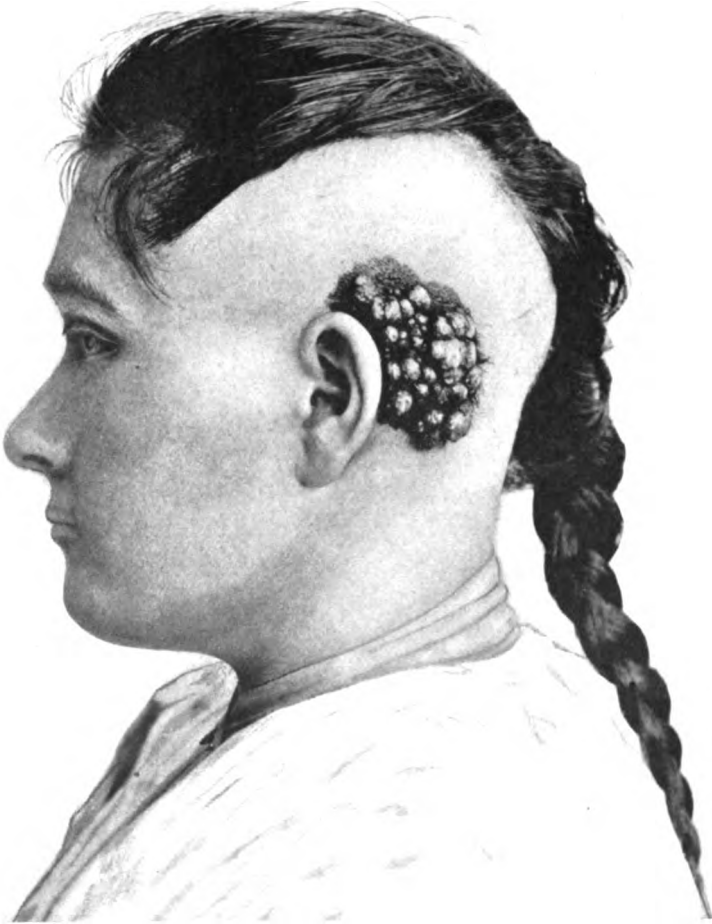
CASE I.

FIG. 2.



CASE I.

FIG. 3.



CASE II.

sion its rate of growth has been much faster and at the same time it became painful and developed a rough, irregular surface; it was especially prone to bleed during hot weather and discharged a brownish serum which had a very disagreeable odor. On admission the tumor, which was deeply pigmented and had a markedly disagreeable odor, covered the entire left scapular region and extended down the left arm as far as the deltoid insertion. Its vertical diameter was $6\frac{1}{2}$ inches and its horizontal diameter $8\frac{1}{2}$ inches, while its cross diameter was 9 inches. Deep sulci traversed the surface and divided it into irregular or oval nodes. Fine hair grew about the edges of the growth and was scattered over it. The glands of the corresponding axilla and the cervical regions were enlarged. Other melanotic spots which were but little raised and not hard were present on the face, arms and body. This was the most extensive melanotic growth we had ever seen. The mass was freely movable and in spite of the glandular involvement and the other melanotic spots over the body it was concluded that excision was indicated. The incision was made well beyond the growth without regard to cosmetic effect. The growth involved the whole thickness of the skin and also the underlying fascia over the tip of the acromion. Projecting through the infraspinatus muscle after the growth was removed could be seen a very dark enlarged lymph-gland. This gland was continuous with the growth and with a number of other glands in the axilla. The axilla was opened posteriorly and a large mass of glands removed, all of which looked hemorrhagic. The enlarged glands in the posterior triangle of the neck were also removed. No attempt was made to cover the exposed area by making skin flaps from the chest or back, as it was thought that such a procedure would be too extensive for the child to stand at this time. It seemed wiser to bring the skin as near together as possible and do skin grafting later.

Skin grafts by the Thiersch method were applied on April 18, June 10, and August 3, 1907, with varying success. Various kinds of dressings were applied, but apparently granulation took place more rapidly under exposure to air than under any dressing. Ultimately the entire surface was covered with scar-tissue.

The child has been seen within the last few months and other melanotic spots have developed and some of the preëxisting ones

have increased in size. The child's general health is perfect, there has been no local recurrence, and none of the other spots present the raised, nodular appearance of the growth which was removed.

The specimen was examined by Dr. Clark Evans, who submitted the following histological report:

"The section consists largely of fibrous tissue. A layer of cornified epithelium forms one margin. At points, processes of epithelium extend inward to a variable depth. In the corium and deeper tissues a collection of oval or round cells with large nuclei reacting to stains. The protoplasm stains poorly. Several aggregations of these cells show tendency to concentric arrangement of their elements. Dense areas of fibrous tissue separate numerous collections of these cells previously described. Granules of black pigment are numerous, being found mostly in the fibrous tissue and cells immediately beneath the epithelial margin.

"Longitudinal sections of roots of hairs show a considerable amount of pigment in the form of black granules as also the structures adjacent to the hairs. Blood-vessels possess walls of ordinary thickness.

"*Diagnosis.*—Melanotic mixed-cell sarcoma of shoulder."

CASE II.—I. S., female, single, aged 22, a housekeeper by occupation, was admitted on October 10, 1907, to the Jefferson Medical College Hospital and operated upon on October 12, 1907. The patient was one of seven children and of healthy parentage, the family being free from any history of malignancy or tuberculosis. She had the usual diseases of childhood, was well developed and in good health. Her present trouble dates from infancy. When three weeks old, her parents noticed a pigmented mole behind the left ear, this gradually increased in size, and became elevated above the surrounding skin when she was about five years old. The growth slowly but steadily increased in size, until one year previous to admission, when its progress became decidedly more rapid; associated with this latter change there was a sensation of burning and itching, with sharp lancinating pains through the tumor. Her general physical condition remained good. Just posterior to the left auricle was a dark pigmented area oval in outline, its longest vertical diameter measuring approximately 3 inches and its transverse diameter 2 1/2 inches. Its surface was lobulated with deep

furrows between the elevated areas. The pigment was of a darker hue between these nodules. The surface was thinly covered with fine hair. The accompanying photograph shows the growth very well.

The growth was excised and the resulting area allowed to granulate. Healing was complete in the course of a few weeks.

The specimen was examined by Dr. John Funke, who submitted the following histological report:

"Longitudinal and transverse sections were obtained. The first-named show the condition to the best advantage. They are covered with a stratified layer of squamous epithelial cells which at no point show any tendency to abnormal proliferation; there are, however, granules of pigment in the layer Malpighii. The papillary stratum and the corium are composed of dense, deeply-staining, wavy fibrous tissue in which are found several sebaceous glands that contain patches of squamous epithelium occasionally in the centre and at other times around the periphery. The papillary layer, corium and subcutaneous structures, also contain nests of cells arranged, for the most part, in plugs, but occasionally in comparatively long strings. The plugs are sometimes grouped as in lobules, delicate fibrils of fibrous tissue separating them. At no point is there condensation or thickening of the fibrous tissue surrounding the group of plugs, the individual plugs or the strings. In the plugs the cells present a concentric arrangement but lack the condensation and keratinization seen in epithelioma, but they do resemble squamous epithelium very closely. They are about the size of an epithelial cell; the nuclei are for the most part oval, and stain deeper than the nuclei of squamous epithelium. The protoplasm is granular and stains faintly.

"In some places the cells are less compact, and smaller, and bear a greater resemblance to fixed connective-tissue cells. Occasionally the elements are arranged in what are, in all probability, lymph-spaces. The cells composing the strings are also less compact and resemble in many instances the fixed connective-tissue cells. These last-named elements now and then contain brownish-black pigment usually in amounts sufficient to mask the architecture of the cell.

"Blood-vessels are often filled with erythrocytes but show no pathologic changes.

"*Diagnosis and Remarks.*—Close study revealed the fact that the cells of the plugs and strings are endothelial in nature. The growth bears all the characters of a lymphangioma hypertrophicum."

In view of the difference in the pathological reports of these two cases we asked Dr. Coplin, in whose laboratory the specimens were examined, and who himself had studied the second specimen, to examine the specimen from the first case, and the following is his report.

"At your request I have gone over Reports No. 3643 and 3644 (case of S. K.) and think there can be no doubt that the tumor in question is the type that has been variously known as melanoma, melanocarcinoma, nævocarcinoma, and melanosarcoma. Pathologists commonly regard the neoplasm as a form of sarcoma. Following Unna most dermatologists place it with the carcinomata. From the clinician's standpoint the oncologic position of the growth is less important than the universally admitted malignant tendency of such tumors, and the designation melanoma possesses the advantage of being non-committal as to its histogenesis. While the cases collated by Dieterich, Wagner, Keen, Wilson and Kalteyer, and also Eve, indicate that the tumor is more frequent after adult life, it is by no means unknown earlier. Dieterich's series included 5 patients between the age of 1 and 10 years. The tumors are usually intensely malignant, although this character may be latent for a long period. One of Eve's patients lived 11 years and in another—melanoma of the dorsum of the hand—involvement of the lymphatics of the arm and axilla was delayed for 20 years."

CASE III.—Mrs. H., aged 47, admitted to the Pennsylvania Hospital and operated upon on July 12, 1907. Her chief complaint was pain and tenesmus at and after defecation, with a protrusion of what she supposed to be a hemorrhoid. Occasionally slight bleeding at defecation occurred. Her family history was remarkably good, there being no history of malignancy or tuberculosis. She is the mother of three living, healthy children. She has always been healthy excepting for occasional attacks of bronchitis. Her present trouble began about four months previous to admission. The protrusion of a small tumor at the time of defeca-

tion was the first indication of the trouble. She was well nourished and of a healthy appearance: her kidneys, lungs and heart were all in good condition. Examination of the rectum showed a more or less pedunculated tumor situated just above the sphincter, which was hard and nodular, and but for its pedunculation we would have thought it malignant. When the sphincter was stretched the tumor protruded readily and was noticed to be of a very dark color. There was a dark area in the mucous membrane extending over about one-third the circumference of the bowel, apparently continuous with the tumor. About 2 inches above the tumor could be felt a hard mass under the mucous membrane and apparently connected in no way with the tumor. As there were some small hemorrhoids both internal and external, these, together with the tumor, were excised by the circular cuff method. The mucous membrane was then dissected up until the hard mass before mentioned was encountered. This was removed; it was about the size of the end of the little finger, very dark in color, looking not unlike an organized blood-clot. We concluded that it must be glandular. The patient made a satisfactory recovery and returned to her home. She was seen 4 months later and was in excellent health; she had no blood or mucus in the stools and was perfectly well excepting that she had considerable difficulty in getting the bowels moved. This was due to the contraction at the site of the excision which necessarily had to include a certain amount of the muscular tissue. The passing of rectal bougies did not relieve the constriction. On December 5, 1907, the scar-tissue was incised at a number of points and stretched. Examination of the rectum at this time showed a mass behind the bowel in the hollow of the sacrum which was composed of two or three nodules. The finger could not be passed above the mass, which felt very much like the nodule which was removed from the posterior rectal wall at the time of the first operation. This was undoubtedly a glandular recurrence, and it was thought that any radical operative procedure was hardly advisable. The patient was again examined on January 22, 1908. The use of the bougies has been kept up and she is having much less trouble getting the bowels moved. The mass behind the rectum did not feel much larger than at the time of the second operation. The pathological

report by Dr. J. Lewi Donhauser of the specimens removed was as follows:

"Original Growth—Gross Description.—The specimen consists of a piece of tissue measuring $2.5 \times 3 \times 1$ cm. Two nodules, one blackish-brown in color and the other of a pinkish hue, are seen attached to the surrounding tissue, which seems to be a small portion of muscle and tissue derived from some chronic inflammatory process. The largest nodule measures $1.5 \times 1.5 \times 1$ cm. It is hard to the feel, blackish-brown in color and somewhat irregular. On section it presents a blackish-brown appearance studded with what appear to be whitish opaque trabeculae. The smaller nodule is attached to the larger by delicate adhesions and measures $1 \times 0.5 \times 0.5$ cm. It is pinkish in color and externally is slightly irregular. Attached to it is a small gelatinous appearing nodule the size of a small pea. On section the second nodule appears to be whitish-yellow in color with here and there an occasional saffron-tinted dot. The small gelatinous appearing piece of tissue is, on section, similar to the larger nodule. To the under surface of these nodules is attached a small strip of skin and muscle measuring $2.5 \times 2 \times 0.5$ cm. The muscle and skin are soft in consistency and do not apparently contain any areas of infiltration.

"Microscopical Description.—All the sections studied show variance in the morphology and arrangement of the cells. The main microscopical characteristic of the tumor is that it is made up of a mass of rambling cells in a somewhat homogeneous basement membrane; this basement membrane is composed of fine fibrils lying in a homogeneous substance which takes an intense eosin stain. The cells of the membrane are for the most part parallel with large and small spindle-cells which form the main portion of the tumor: the nuclei of the former are very large and their nuclei are very prominent. In many areas there are but slight evidences of fibril substance owing to the density of the tumor cells. In other areas many fine trabeculae are seen between main cells and apparently originating in the intercellular substance. Throughout the sections are numbers of multinucleated cells whose nuclei are for the most part centrally placed, though an occasional mural and bipolar arrangement is noted. Many of the cells are arranged in fascicular fashion and are surrounded by

strands of fibril substance which gives to the field an alveolar appearance. Scattered throughout are amorphous masses of a mahogany color which are found both intra- and extracellularly. The large spindle and the large multinucleated giant-cells show especially the tendency toward the taking up of the pigment. The blood- and lymph-vessels are somewhat increased but have very thin walls, many of them containing desquamated endothelial cells. Mitotic figures are abundant. A portion of the skin which was removed at the operation is entirely normal. A small portion of rectal mucosa is seen to be infiltrated by the tumor.

“Diagnosis.—Melanotic sarcoma of rectum with metastases to adjoining lymph-nodes.

“Metastatic Growth—Gross Description.—The specimen consists of a small oval bit of tissue the size of a large bean. It is slightly irregular in outline and has attached to it small fatty tags. It is hard to the touch. On section it is yellow opaque in color, somewhat gelatinous in consistency and is studded by a tissue of a darkish hue which seems to start from the periphery and run towards the centre of the nodule where it takes on a dark brownish-black appearance.

“Microscopical Examination.—Metastases of lymph-glands.”

The accompanying drawing shows well the structure of this tumor.

Melanotic growths were described by M. M. Boyle and Laeneck early in the last century, and Dupuytren is credited with having drawn attention to them prior to these observers.

The most common origin of melanotic tumors is from the uveal tract, and from pigmented moles of the skin, the latter being generally congenital. However, cases have been reported that could not be attributed to either of these sources. Eve¹ refers to three cases in which the tumors commenced in the matrix of the nail, three at a mucocutaneous junction, one on the vulva, one on the inner surface of the cheek, and one on the palate. He also states that Herman removed a melanotic tumor of the ovary and Rydygier one arising from the epididymis. In the same report, reference is made to several cases in which the neighboring glands and viscera became involved without any apparent enlargement, or change in the mole from which the melanotic neoplasms must have originated.

Age is not a controlling etiological factor in the malignant tendencies of pigmented moles. Wilson and Kalteyer² give the age of the youngest of their thirteen cases as 21 years and the oldest 65 years. They are more frequent after middle life; the order of frequency of the site of the primary tumor is first on the trunk, next on the extremities, and then on the head.

The association of injury or irritation of a pigmented mole is considered by most authorities as the exciting impulse responsible for the transition from a benign to a malignant growth in many cases. There is a wide range in the degree of their malignancy. The average duration of life after the malignant change takes place is between two and three years, but ten years has been reported; and in one of Keen's³ cases recurrence had not followed seven years after operation on the primary tumor which the microscopical examination had shown to be a mixed-cell sarcoma.

Metastatic growths are prone to take place early in these malignant neoplasms and usually first invade the neighboring lymphatic nodes, and then may become widely distributed, involving the subcutaneous tissues over the entire body, and sooner or later the viscera are involved, nodules being present in the liver, spleen, kidneys, lungs and brain.

The degree of pigmentation varies in different cases. The primary growth may contain little or no melanin, while the metastatic nodules are deeply pigmented; or the reverse of this may occur, *i.e.*, the parent growth may exhibit dense melanotic infiltration, while the secondary tumors are but slightly colored.

Various views as to the histogenesis of these growths have been held by different authors. Virchow⁴ states that he believes melanomata are hyperplastic developments of the pigmented connective tissue of the skin, which at a certain stage of development assume a sarcomatous change.

After Von Recklinghausen's⁵ monograph in 1882, pigmented soft moles of the skin were generally classified in accordance with his views as "lymph-angio-fibromata," and the malignant changes derived from them, as belonging to the group of connective-tissue tumors. In 1893 Unna⁶ published his observations on the origin of soft moles, concluding that they came from the epithelium of the skin. With the advancement of these opinions two schools

have developed, those holding to the epithelial origin on the one side, and on the other those who regard them as being of connective-tissue derivation. Adherents of the two theories have produced an immense amount of admirable literature to support their respective beliefs. Unna, after studying a case of Tennant's of Glasgow, which had been reported as a sarcoma, found it to be, in his opinion, a carcinoma. Unna's further studies were conducted on pigmented nævi of the new-born and children, which seemed to furnish the necessary evidence to demonstrate that the nævus-cells were truly epithelial in origin. He observed first a metaplasia of some of the cells of the lower layer of the epiderm which are pigmented, and which separate themselves, in the form of round nests, from their neighbors. In this transformation, these cells become round or nearly so, they stain less deeply, the protoplasm clears up, and every vestige of prickles disappears. These groups of cellular elements draw away from the other epithelial cells, and gradually pass into, and are surrounded by, the connective-tissue of the corium, where they remain quiescent until called into activity by some future influence. It is from these cells that he considers the typical nævus-cells are derived. This process of dropping down of the nests of epithelial structural cells into the corium, Unna considers, furnishes the best possible basis for Cohnheim's theory.⁷ He opposes the belief that these nævus-cells originate from the lymphatic endothelium because there is an absence of concentric arrangement of the cell which should exist on cross-section of the cords, and in which no regular lumen can be demonstrated, and because the direction of the cellular cords is vertical at the margin of tumors, while the lymphatic vessels are horizontally arranged. He further argues that the cords cross each other at all possible angles, while the lymph-vessels do not. The columnar grouping of the cells is poorly marked as the hypoderm is approached, while the lymph-vessels are more regularly arranged in this situation normally. There is a great difference in the diameter of the cellular cords, which he regards as being strong evidence against their occupying preformed channels. He was able to demonstrate the lymph-vessels as being free, and followed these through as dilated spaces in nævi that were not too dense. He believes the resemblance of the cellular columns to lymph-angioma of the skin, as

pointed out by Von Recklinghausen, is due to pressure. By distending the lymph-vessels of the healthy skin by injections, he found that these did not resemble in outline the cellular cords of *nævi*. The cords are composed of small cubical or elongated cells, rich in protoplasm, which have a relatively large, oval, clear vesicular nucleus, and resemble very much, except for prickles, the surface epithelium. He also points out that within these cellular cords, there is no collagenous material or elastic tissue, and no distinct intercellular substance, which are characteristics similar to those noted in *epitheliomata*. He has not been able to recognize "Mitosis." Unna's views have been accepted by many observers.

Whitefield's⁸ investigations confirmed those of Unna, and he noted two classes of these tumors; one variety slightly malignant and made up only of cells resembling those recently derived from the epiderm and retaining the appearance of the parent cells, and the other group a more malignant form, composed in part of the epithelial cells just described, and having besides, placed deeply in the corium, cells arranged in alveoli, having lost nearly all their protoplasm and corresponding to the typical cells of the *nævus cord*. Eve⁹ asserts that some of these tumors are histologically "definitely *epitheliomata*." He considers the poorly defined character of the cell elements as being due to the fact that the most of them originate from pigment moles, which he regards as congenital defects, and "that the epiblastic cells from which these tumors spring are imperfectly differential." He states that Unna's contentions are generally accepted. Gilchrist¹⁰ also favors Unna's views and was able to corroborate his findings in regard to metaplasia of epithelial cells in children. Schalech¹¹ thinks there are many difficulties in reaching a definite conclusion, but believes Unna and his followers are probably correct. He holds that *melanosarcoma* may arise from the pigmented cells of the epidermis; that these cells proliferate into the connective-tissue, and in time become separated from the epiderm, and eventually lose their epithelial character.

There is an equally imposing array of evidence presented by those who do not agree with Unna, and while corroborating many of his observations, they question his interpretations. Bauer¹² states that in all of the sections studied by him he was able to

demonstrate an intercellular substance by using the proper staining method. He was further able, by serial sections, to invariably demonstrate a fibrous stroma, separating the epiderm from the cells of the new growth, or *nævus cords*. He found in many cases that the rete pegs dipped well down into the corium, so that the papillæ of the corium were of large size, and in some instances he detected marked cornification going on in the epidermis. This we shall refer to later.

Bauer's conclusions are the same as Von Recklinghausen's, except that the latter's term of "lymph-angio-fibroma," implies an increase in the connective-tissues, which he holds does not always exist, and he suggests the name *endothelioma*. Ribbert¹³ maintains that the views of Unna, Delbanc, and Kromeyer concerning the genesis of the cells of soft *nævi* are not tenable, and holds the opinion that the constituents of the *nævi* are to be considered as developed pigment-cells. From these elements he considers the tumors of the skin take their origin, just as those of the eye are developed, from the chromatophores of the choroid. Ribbert states that the melanomas are, therefore, to be regarded as developing from the proliferation of a definite characteristic cell type. They are "pigment-cell tumors." Ziegler¹⁴ regards them as "hyper-trophic lymphangiomata or endotheliomata."

Johnson¹⁵ has studied in all 29 pigmented moles; great care was exercised to avoid injuring the fresh specimen; in orienting the tissues they were so placed that perpendicular sections could be obtained, and they were cut and stained in serial sections. He states that he was able to find the histological changes described by Unna and his followers not only in the *nævi*, which were still developing, but in completely quiescent ones of adult life; that he found this change not only over the tumor proper, but also in its vicinity beyond the margins of the growth. The alterations in the cells, especially shrinkage, suggest the appearance of cyst-formation. He points out that he has "followed this change through serial sections scores of times and has never, in any instance, succeeded in tracing a complete separation of the metaplastic cells from the mass of epithelium, or any connection between them and the *nævi*, nor any failure in the interposed line of connective-tissue." He agrees with Bauer that a lumen may be seen formed by the cells

of the column, and an intercellular space is a common occurrence. He found at the extreme border of young developing moles, that the "lymph- and blood-vessels are directly continuous with the nests and cords of nævus-cells."

In studying 16 cases Fox ¹⁶ is led to enter the list of Unna's adherents, concluding that in moles, where the cells are arranged in typical nævus columns, these cells are epidermal in origin. He states that most cases of melanoma originating from moles are nævocarcinoma, but that there is a variety of soft mole which does not show the particular nævus-cell arrangement, whose origin is not definite and may possibly be mesoblastic. He is disposed to accept the theory that pigment is closely associated with the exciting cause of malignant changes in moles, and observes in this connection that in infants those parts of a mole which show very rapid cell-nest formation are most pigmented, and in some instances the pigment is confined to the prickle-cells forming these nests; he notes that the location of melanin in the epiderm coincides with the areas of cellular invasion in the corium, thus suggesting that the infiltration of cells in the corium was dependent upon the pigment in the epiderm. He is inclined to the opinion that pigment is elaborated by the epithelial cells.

The origin of the pigment of the nævus-cells has not been sufficiently determined. There are a number of views held, but the two principal ones are, that it is derived from the hæmosiderin of red blood-cells; and the other theory, that it is elaborated by certain cells of the body. The latter opinion is most generally accepted, and this function is ascribed to special cells called chromatophores, which owe their origin to the melanoblast, derived from the mesoderm.

Ehrman,¹⁷ who has contributed an admirable and exhaustive work on this subject, believes that the pigment is derived from a special cell, the melanoblast, which takes its origin from the mesoderm. By proliferation, some of these cells grow up into the epiderm, and there establish an independent cell existence. He states that it has not been demonstrated that cells of the base of the epiderm metamorphose into chromatophores, and that this still remains an open question. He believes the melanin is formed in the chromatophores, and flows from them into the cells of the

epiderm, and of the hairs, from protoplasmic projections of these pigment producing cells. Melanin contains no free iron; it is soluble in alcohol, ether, mineral acids, solutions of caustic potash, and bleaches with chlorine. That pigment is brought to and taken up by the endothelial cells is assured, and in extreme cases of melanosis, the endothelial cells of the capillaries are pigmented to such an extent that the organs of the body are discolored.

In our brief review of the claims of Unna and his followers which embodies a description of the metaplasia and separation of the epithelial cells from the epiderm, we receive the impression, not easily dispelled, that they are describing a process of degeneration rather than one of metaplasia. The loss of cell-granules, the clearing of the protoplasm, the lessened power of staining, the loss of prickles, and the shrinking of the group of cells, are very suggestive of lessened cell vitality. In all the malignant growths known to have certainly arisen from the epiderm, we can find nothing to correspond to this process in the most remote manner, with the exception of the early stages of pearl-formation in the epiderm and in epitheliomata. Early keratinization of the epiderm was observed by Bauer and Johnson, in their studies; and in an immature stage it might readily be taken for the process described by Unna. That degenerative changes in the epiderm are prone to take place, is rendered highly probable when we reflect that the epiderm is dependent for its nutrition upon the corium, and as this is invaded by cells of new formation, a certain amount of nutriment does not reach the overlying structure, or epiderm.

That the cords of the nævus-cells do appear to extend to the lower layers of epiderm is probably true, as it has been shown that the lymphatic vessels only cease at the base of the epidermal cells. This appearance is occasionally seen in both cases.

Another source of confusion is that two processes may be operative at the same time, *i.e.*, epithelial proliferation as well as endothelial. This is well illustrated in Case II, photograph 4, in which one of the rete pegs is prolonged, and enters a sebaceous gland. In the centre of this gland there is a limited number of isolated cells fairly well shown in the microphotograph, unmistakably proliferated epithelium. In the same section are pictured groups or whorls of cells resembling those of the epithelium situated in the

upper part of the corium, so arranged as to suggest the normal outlines of former sebaceous glands replaced by these proliferating cells. These groups of cells, however, seem almost too numerous to be entirely confined to the limits of sebaceous glands. It is apparent that certain changes occurred in the cells comprising these masses or whorls, since the cell outlines are indistinct, their nuclei stain poorly, and their protoplasm is homogeneous and fails to stain distinctly; on the whole these alterations suggest keratinization, but it is far from being typical of this condition. The most striking feature of the remainder of this growth is the large amount of fibrous tissue, and the rather scant supply of blood-vessels. The latter structures are generally well formed, and are usually surrounded by pigmented cells. The lymph-spaces are occupied in some places by peripherally arranged pigmented cells supplied with a relatively large amount of protoplasm and with a vesicular large nucleus (microphotographs 5 and 6). A longitudinal section gives the appearance of long cords composed of these pigmented cells, apparently following the lymph-spaces. Here and there are areas which indicate that the cells underwent rapid proliferation, and assumed an alveolar arrangement. In the corium there are found a few widely scattered cells containing from 5 to 10 nuclei, irregularly placed in the cells. In the fibrous stroma, large cells resembling those of the cords are seen, which probably are proliferated fibre-cells. In the alveoli the grouping of the element is irregular as a rule, and occasionally an intercellular substance can be seen, but it is not usually present. The blood-vessels are confined to the fibrous stroma, and do not run between the individual members of the cell-groups.

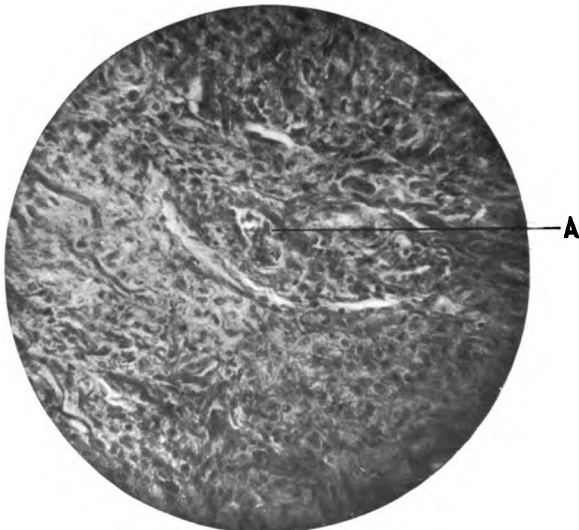
In Case I the microscopical appearance resembles Case II, but certain differences will be pointed out. The rete pegs are much longer, and dip well down into the corium. Within the epiderm are epithelial pearls in various stages of formation (microphotograph 7). There is much less fibrous tissue, and the cord-formation is more typical of *nævi*, the cells forming the cords are slightly pigmented in the upper stratum of the corium, and not at all in the deeper layers. The greatest amount of pigment being in the cells of the lower areas of the epiderm, the lymph-spaces are not so easily determined, it is not possible to demonstrate a lumen,

FIG. 4.



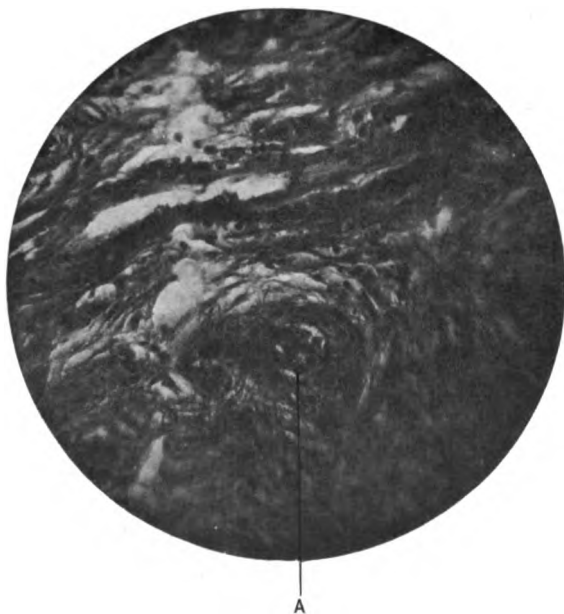
CASE II.—A. Proliferating epithelium invading sebaceous gland. B. Epithelial whorls.

FIG. 5.



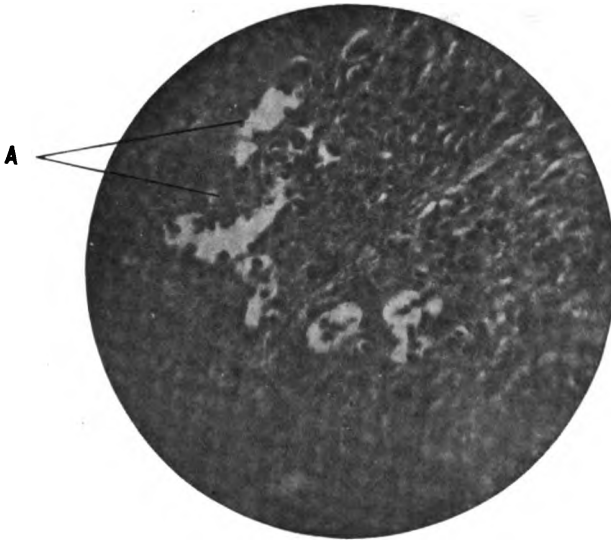
CASE II.—Proliferating cells on blood vessel.

FIG. 6.



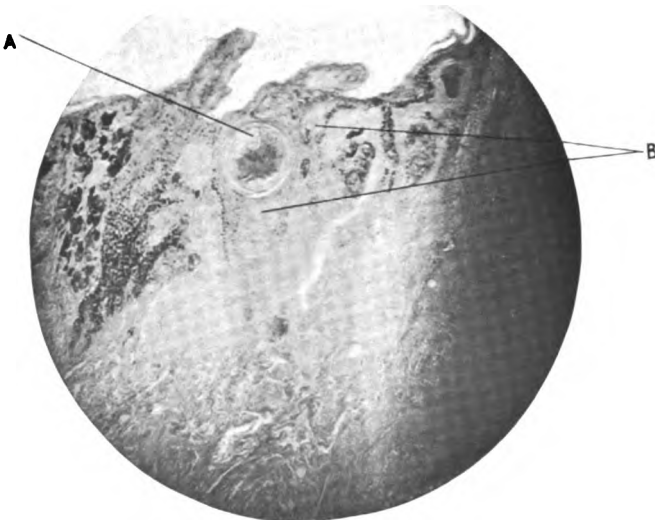
CASE II.—A. Proliferating cell within lymph vessel.

FIG. 7.



CASE I.—Lymph spaces with peripherally arranged endothelial cells.

FIG. 8.



CASE I.—A. Well-formed epithelial pearl. B. Early form of epithelial pearl.

FIG. 9.



CASE III.—Melanotic sarcoma of rectum.

the blood-supply is greater, and while many of the vessels are well formed, there are some in which the endothelium shows evidence of proliferation and in several places the vessel outlines are indistinct and seem to be continuous with the cells forming the cords (microphotograph 8), there are fewer multinuclear cells than in Case II and an intercellular substance is not distinctly demonstrable (microphotograph 7).

One cannot review even a small portion of the great mass of literature of soft moles and malignant tumors arising from them, without being impressed with the divergent opinion held by a number of writers upon this subject. Many histological descriptions by those holding diametrically opposing views, as to the histogenesis of these growths, are in the main identical, but their interpretations and conclusions are quite different. The histological findings may not correspond with the characteristics of either of the two classes of malignant growths, the sarcomata and carcinomata, and yet certain features common to both are referred to by these workers which offer reasonable grounds for placing the particular growth the authors are discussing, into the group that most appeals to them. This evidence, linked with the well-established fact that certain endotheliomata resemble carcinomata, as well as the question, whether certain neoplasms arising in the kidneys, suprarenal glands, etc., designated carcinomata, are really such, lead us to consider whether our present classification is all that can be desired.

Recently Adami has put forth a classification of tumors based on the modern embryological conception of the function the embryonal membranes are destined to perform. His plan to a certain extent rectifies some of the deficiencies of the earlier classifications. Briefly, the following facts constitute the fundamental principles of his classification. The earliest development of the fertilized ovum is a group of cells almost entirely without differentiation. This cellular mass forms into two membranes, the epiblast and hypoblast. From the epiblast are derived the nervous tissue, the epiderm and its appendages, *i.e.*, the nails, the hair, the glands of the skin, and the mammary glands. The hypoblast gives origin to the mesoblast, the notochord, and then furnishes the epithelium for gastro-intestinal tract and its associated glands, the liver, pancreas, etc. The mesoblast, by the proliferation of its cells, brings

forth two varieties of tissue; one the mesothelium, which is destined to line serous cavities, to form striated muscles, and by the dipping down of processes and formation of tubules to furnish the parenchyma of the genito-urinary organs, suprarenal glands and other glandular structures. The other known as the mesenchyme, originates the various connective-tissues, which form the stroma of all organs, the unstriated muscles, the spleen, the walls of blood-vessels and possibly the endothelium of the blood-vessels.

The tissues of the body may thus be divided into two general groups: (1) those which *line surfaces*, and to which Adami has given the name "Lepidic," meaning a husk or rind, and (2) those tissues which form the *supporting structure* which he terms "Hylic," derived from words meaning pulp or raw material. It will be observed that lining membranes or Lepidic tissues are derived not only from the epiblast and hypoblast, but also from the *mesothelium*. Adami further points out "that even in cases where there is the widest divergence from the original type of lining membrane, we find this distinction still holds good, that the parenchymatous cells form layers or groups, into which vessels do not penetrate, and in which there is an absence of stroma between the members of the cell-groups, the cells being at most united by bridges and by a fine cement material." He further contends that the pulp-tissues on the contrary have an "intercellular ground-substance either homogeneous or fibrilated, separating the specific cells of the tissue," and blood-channels are found between the individual members of cells composing a group. These histological peculiarities, it will be noted, constitute the principal points which differentiate carcinoma from sarcoma. Upon the special characteristics of different tissues, he bases his classification of tumors, designating growths arising from lining membranes, depending upon their embryological derivation, epilepidomata, hypolepidomata, mesolepidomata, and those from the pulp-tissues are termed epihyalomata, hypohyalomata, and mesohyalomata.

We believe it possible to reconcile the slight differences in the views of Virchow, Von Recklinghausen, Ribbert, and Johnson who are representative of those opposed to Unna's theory if we accept Adami's classification, based as it is, upon the ultimate functions of embryonic tissues. This is further elucidated by remembering

that, with highly specialized cells, the properties and characteristics last acquired in their development are the first lost in retrogressive processes; and that the more rapid the growth of the tumor by the proliferation of its cells, the greater will be the departure from the normal adult type of tissue, and the more marked will be the reversion to earlier forms, which have their prototype in some of the embryonic tissues. In growths of mesodermal origin, it may be possible for the cells to revert to any of the earlier types through which they may have passed in their ascent to form specialized tissues.

Ehrman's conclusion that chromatophores are of mesoblastic origin lends support to the views of Virchow and of Ribbert in so far as these authorities suggest that the tumor-cells are pigment producers and are of mesoblastic origin. Virchow's and Ribbert's opinions are not far removed from those adhering to the endothelial origin since each of the three named theories embodies the conception that the cells comprising the neoplasm are derived from the mesoblast. It is conceivable and not improbable, that tumors derived from different specialized cells having a common origin, may have certain similar characteristics which depend on their retrogression to an earlier embryonic form of tissue.

Following this line of thought, it is possible to reconcile the various histological reports by observers of sarcoma and its subdivisions, if we admit these differences in the tumor to be the result of a reversion to an earlier type of tissue.

The writers believe they are not justified in arriving at a definite conclusion regarding the histogenesis of both of the tumors reported in this paper but certain features seem worth recalling. The tumor in Case II, which was of slow growth, shows two different processes going on: the one involving the epithelial elements, while in the other and most important, because it constitutes the tumor, the origin of the cells is difficult to determine. The morphology of the latter cells does not warrant us in deciding definitely whether they arose from the epithelium or the endothelium. These cells do not only compose the elements of the cords, but they are found in lymph-spaces, and in variable numbers outside of blood-vessels in contact with the vessel-walls. Their presence in the lymph-spaces is difficult to explain unless they are proliferating

endothelial cells. This assumption is probably true as in many places the cells seem to have taken their origin from those cells forming the lymph-vessels. This evidence seems to justify our inclination to regard this as an endothelial lepidoma. In sections taken from Case I an examination of the areas where the cord-cells seem to join, and appear to be continuous with the epidermal cells, shows a rather abrupt change in the appearance of the cells; but these histological differences are not distinctive enough to justify a definite opinion as to the true condition. The fact that the epidermis is thinned, we are inclined to believe indicates that the epidermis has been encroached upon by the upward growth of the cord-cells. This conclusion is corroborated by the careful researches of Bauer, Ribbert, and especially Johnson. We are unable to determine with the same distinctness as in Case II the activity of the endothelium of the lymph-spaces. There is an absence of some of the principal features exhibited by malignant connective-tissue tumors, while on the other hand, it does not conform in every respect to malignant epithelial growth but does possess the characters common to the lining membrane group of tumors or lepidomata. In none of our examinations was it possible to verify Unna's claims of the metaplasia of cells and their dropping into the corium.

For the present we believe these neoplasms should be classed among the lepidomata, and in certain instances, as in Case II, the evidence presented by a histological study may even justify placing the tumor in one of the subdivisions of the lepidomata.

Although melanotic sarcoma occurs practically in no other portion of the intestinal tract excepting the rectum, the instances of its occurrence here are very rare. In all of the literature there are probably not more than 15 or 20 cases reported, and in some of these it is a question whether or not the growth did not start in the skin about the anus.

Corner and Fairbanks¹⁸ have made an exhaustive study of sarcoma of the alimentary tract and have collected 175 cases; of these 17 were sarcoma of the rectum, and but 2 of them were pigmented. In this series of cases is included Sir Frederick Treves' unique case of melanotic sarcoma of the ileum. In one of the 2 rectal cases there were 3 polypoid masses, only 2 of which were

pigmented. The authors believe that glandular involvement and metastasis are less common than in carcinoma.

Probably the most extensive collection of cases of melanotic sarcoma of the rectum is that by Nepveu.¹⁹ The ages of the patients in this series ranged from 44 to 64 years. An interesting observation is that in some of these cases the excrement was colored black, and that the finger after a digital examination was also stained with the pigment. The course of the disease in all of these cases was rapidly fatal, no patient living over three years.

Wiener²⁰ reports a case in which he is inclined to believe the growth originated in the pigmented skin of the anus. He calls attention to the arrangement of the tumor-cells around the blood-vessels, stating that they often form a sheath or even penetrate the lumen, and this he ascribes to the demand for nutrition on the part of the cells. On this account some authorities believe that the growth originates in the blood-vessel wall. Wiener calls attention to an interesting fact in regard to melanotic sarcoma, which is that it is quite common in gray and white horses.

Mr. Harrison Kripps,²¹ in his work on diseases of the rectum, refers to the rarity of sarcoma of the rectum excepting of the melanotic variety, and reports a case of melanosarcoma in a girl of 16 years. The growth was about the size of a walnut and situated just within the anus.

One of the early cases of melanotic sarcoma is reported by Moors²² as occurring on the verge of the anus, and not extending far up into the bowel.

Ball's²³ contribution to this subject is one which is frequently quoted, and includes a report of a case in which the growth consisted of three nodules but two of which only were pigmented.

G. Heaton²⁴ reports a case occurring in a male, 48 years of age, in which he believes that the growth originated in a mole of the rectum, and that the postrectal glands later became involved. This case is similar in this respect to our own case.

Gant²⁵ states that he has seen 2 cases of melanotic sarcoma of the anus in which the skin and deeper structures were involved to a considerable extent, while the mucosa was but slightly involved.

One of the recent contributions to the subject of melanotic sarcoma of the rectum is that of E. Key,²⁶ who reports two cases

which are incorporated with 38 others which he has collected from the literature, but he states that the diagnosis in many of these is doubtful. He believes that in many cases of sarcoma of the internal organs probably the primary tumor, a mole for instance, had been overlooked, and that in some cases blood-pigment has been mistaken for melanin; hence, the tumors were really not melanotic. In his first case the growth was 5 cm. above the anus, and was partly covered with pavement epithelium which he thinks may have been derived from an infolding of the epiderm. In this case, however, a previous operation had been performed which tends rather to detract from the value of this opinion. In his second case there was very little pigment in the anal region, and the loss of this pigment in moles which are undergoing malignant change has been noted by Langenbeck. This change of color has been thought by some to be an indication of a malignant change.

¹ *Eve's Practitioner*, Feb., 1903.

² Wilson and Kalteyer, *Am. Jour. of Med. Sci.*, Nov., 1903.

³ Keen, *Jour. Am. Med. Assoc.*, 1904.

⁴ Virchow, *Die Krankhaften Geschwulste*, bd. 2.

⁵ Von Recklinghausen, *Über die Multiplen Fibroma des haut*, 1882.

⁶ Unna, *Berlin klin. Wochenschrift*, 1893.

⁷ Unna, *Histopathology of disease of the skin* (Walker's trans.) 1894.

⁸ Whitefield, *Brit. Jr. of Derm.*, xii, 1900.

⁹ *Eve's Practitioner*, Feb., 1903.

¹⁰ Gilchrist, *Jr. of Cut. and Genito-Urinary Dis.*, 1899, xvii.

¹¹ Schalech, *Jr. of Cut. and Genito-Urinary Dis.*, 1900, xviii.

¹² Bauer, *Verchow's Archiv.*, bd. 142.

¹³ Ribbert, *Beitrage z. path. Anat.*, 1897, 221.

¹⁴ Zeigler.

¹⁵ Johnson, *Jr. Cut. Dis.*, 1905, 223.

¹⁶ Fox, Wilford S., *The Brit. Jour. of Derm.*, March, 1906.

¹⁷ Ehrman.

¹⁸ Corner and Fairbanks, *The Practitioner*, June, 1904, 810.

¹⁹ Nepveu, *Bulletins et Memoires de la Societe de Chir. de Paris*, 1880, 82.

²⁰ Wiener, Gustav, *Beitrage zur pathologischen Anatomie und zur allgemeinen Pathologie*.

²¹ Harrison, Kripps, *Diseases of the Rectum and Anus*, third edition, 1907.

²² Moors, *Medical Times Gazette*, 1857, i, 261.

²³ Ball, Chas. B., *Lancet*, 1885, i, 65.

²⁴ Heaton, G., *British Medical Journal*, April 21, 1894, 858.

²⁵ Gant, *Diseases of the Rectum and Anus*, second edition, 1902, 523.

²⁶ Key, E., *Nord. Med. Ark., Stockholm*, 1905, xxxviii, No. 7.

THE MODERN TREATMENT OF FRACTURES BY MEANS OF DIRECT INTERNAL SPLINTAGE *

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THE treatment of fractures has always been a department of surgery encompassed with many difficulties—the despair and perhaps the scandal of many practitioners. Of recent years, in particular, the use of skiagraphs has laid bare before the people in general and ourselves in particular, the fact that under the present methods of treatment a broken bone is rarely if ever restored to its original shape. Perhaps a skiagraph taken some time after the fracture is shown to a jury and the medical man forced to pay damages; it may be for no fault of his own. The public have a right to expect a fairly correct diagnosis in a case of fracture; and the use of the X-rays is most helpful in arriving at such a diagnosis. It is therefore foolish to neglect such help when it can be obtained; but a man who breaks a bone has no right to expect a perfect result and to complain if he does not regain every ability which he possessed prior to the injury. If he smashes his motor-car badly, it may be and usually is impossible to repair it so well that the engine, with no new parts, is as good as if no accident had happened to it. Hence as it is unjust to expect perfection in all cases of the treatment of fractures, let us then examine the general features of the methods of treatment at our disposal.

They consist of splints and massage, or both. The treatment by massage is the more modern and is a most useful adjunct; the treatment by splintage is a very old method, in fact it originated at the very dawn of surgery. The ancient method of the treatment of fractures by splintage has not progressed to anything like the

* Part of an address delivered before the Medical and Physical Society of St. Thomas' Hospital.

extent which other and more recent branches of surgery have, such for instance, as the surgical treatment of abdominal lesions. The subject of this lecture is to put the question of the modern treatment of fractures before you.

First of all, what are the general features of this treatment by splintage? Splints are applied to the outside of the injured part in order to keep it at rest, and to hold the fragments of the broken bone together and in the proper position in which the fragments are to unite. Splints easily accomplish the first condition,—keeping the part at rest. But they are placed along the outside of the limb and are separated from the bones they are to hold in apposition by skin, fat, muscle, extravasated blood, etc. Moreover the splints cannot be applied tightly without interfering with the blood supply of the part, perhaps cutting it off altogether and causing gangrene. In consequence they must be bandaged on with tightness just short of interfering with the blood supply, with the result that the fragments of the broken bone can move upon each other within the splints. The force of this argument will be appreciated if an attempt is made to fix in good apposition two portions of a broken walking-stick inside a pillow by means of splints bound lightly along the outside. The attempt is childish. Splints which are placed along the outside of the limb may be termed *external splints*. And the method, as the splints are not placed directly on the fragments, may be called *indirect splintage*. On the whole the clinical results of this rough and inexact method are good. But, like everything else in this world, the method has its limitations; so that it must not be expected to do everything. Considering the ancient origin and lineage of this method of indirect treatment of fractures by external splints, it is a fair question to ask if modern surgery has devised anything to supplement it. The answer is “yes.” Modern surgery can supplement it by the method of applying “splints” directly to the fragments of the broken bone; the splints being internal and the splintage direct instead of external and indirect. So that the ancient method was indirect splintage by means of external splints; and the modern method is direct splintage by means of internal splints.

Naturally internal and direct splintage can be accomplished only by means of an operation. Hence the modern method is a corollary

of the advances of modern operative surgery. The internal splints are silver wires, silk, plates, screws, etc., each different fracture requiring different treatment. The operations are often long and difficult, the technical work which the surgeon has to do being often extremely intricate. It will take many years before the treatment of fractures by internal and direct splintage becomes common, or frequently supersedes the more popular one of external and indirect splintage. Therefore it will be wise if the modern method be considered merely as supplementary to the more ancient one. And like a good supplement should, it will be of most use at the very places where the older method fails. In such a manner it will be considered.

The method of indirect splintage by means of external splints fails conspicuously in three situations: (1) in fractures of the shafts of bones, particularly if they are surrounded by thick muscles, as the femur; (2) in the neighborhood of joints, such as the knee; (3) when one or both of the fragments are too small or too thickly covered by tissues for the splints to grasp them, such as fractures of the neck of the humerus or femur.

The modern method of direct splintage by means of internal splints will be considered under these headings; but previous to that the limitations and conditions of the method must be stated, in order to give a clear idea of its applicability.

A. In the first place internal or direct splintage is the descendant of the modern technic of asepsis in the healing of wounds. If a successful result is to be obtained, there must be no suppuration; because it would lead to the infection and necrosis of parts of the bone, followed by the separation of sequestra with the local destruction of the part and, perhaps, of the patient's life as well. When the internal splint is in the neighborhood of joints there is also to be considered the danger of suppuration in the joint, and perhaps the destruction of that joint. A good result can be obtained only by the rigid adherence to the principles of surgical cleanliness. These principles are well known; but there is one which is highly important and not so well known or appreciated. I have insisted on it elsewhere in an essay upon the "Common Causes of Failure in Surgical Procedures," published in the *Clinical Journal*, September 13, 1905, pp. 349-352. At an operation the parts surgically

most unclean are the patient's, the surgeon's and the assistants' skins. It is impossible to exclude humanly these possible sources of infection, and therein lie the natural limitations of our art. Nothing should ever be put into wounds which has been in contact with any of these dangerous places, such as the handle of the knife. Our ancestors in mediæval times used to employ their fingers when eating their meals; to this day we still use our fingers to eat bread, whilst knives, forks and spoons have replaced them for meat, soup and sweets. Indeed, education has advanced so far that it is considered ill-mannered and a sign of bad education to attempt to eat soup or meat with our fingers. Rubber gloves have a distinct rôle and a distinct danger; their *rôle* is to save a surgeon's hands from contamination and from the risk of carrying infection; their *danger* is that they are apt to become a subterfuge for imperfectly washed or surgically unclean hands. In fact, they are subject to as much abuse as chemical antiseptics have been in the "short, perfunctory dip of the hands" in them. To encourage their use in clean cases must be a bad surgical training. Perhaps it will come to be considered a sign of equally bad breeding to use fingers at the operation table as at the dinner table. The surgery of the future is likely in great part to become what has been called "knife and fork surgery."

B. Thus the first limitation of our modern method of treatment of fractures is that there must be no suppuration, but the corollary that there must be healing by primary union is less easily attained. This is a curious difference, founded on clinical and not upon bacteriological observations. An operation, perhaps the wiring of some bone, is done; the wound heals except in one place where a sinus forms, leading to the wire or plate. In due course, the foreign body is removed and the wound heals. There is no necrosis of the bone and no obvious question of suppuration. The true explanation lies, I believe, in another direction. Every person, for instance, has a dosage of opium with which his economy can deal and any excess of which will prove fatal; naturally, too, the exact dosage will vary with his general health. In a similar way every given set of tissues has a certain dosage of foreign body with which it can deal and encapsulate with fibrous tissue, such as the aseptic ligature after operations. Any excess of this dosage, the tissues will be unable to encapsulate and an "aseptic," or better non-septic, sinus

will form. It is not argued that no micro-organisms are present,—*Staphylococcus albus* probably is present. But it is urged that the prime factor in the non-healing or sinus formation is the over-dosage of the tissues with “foreign body” and not the action of micro-organisms. This explanation was first thrust upon me when using a filigree metal frame to cure a ventral hernia. The presence of the aseptic sinus necessitated eventually the removal of the plate. Hence failure in primary union must not necessarily be regarded in these cases as due to suppuration and, therefore, tantamount to the failure of the operation.

C. The use of internal splints has the very great advantage over the use of external splints in that massage can be begun as soon as the wound has healed or even before that time.

D. Internal splints, like external splints, must not be applied too tight. Indeed, nature makes provision for this. So that if a wire or a screw is used nature quickly commences to absorb the hard tissue contiguous to them, loosening them in a few days. After a few weeks they are sometimes quite loose although the operation has been devoid of sepsis. Hence, union between the fragments must begin to take place quickly or the internal splints will become loosened. The internal splintage for broken bones in which union has been delayed is likely to be successful only when the delay has been due to some muscle or nerve being interposed between the fragments, or other local condition. Indeed, probably it will be unsuccessful if the delay in the union between the fragments is due to some general disease, or an unfavorable condition of the bones.

E. Internal and direct splintage by operation should be practised in simple fractures if the best results are to be expected from it. Up to recent years it has been used in cases of compound fractures, but compound fractures are apt to be septic, and as asepsis is a fundamental condition for its success, internal splintage is unlikely to be successful when used in compound fractures. Its merits and demerits must not be judged by the results hitherto obtained in such cases.

It will be seen that the technic of such operations must be very difficult and will require extreme care and attention if good results are to be obtained. Internal splints will in no way do away with

the use of external splints, they will only supplement their use. Earlier in this paper it was pointed out that external splints have two chief functions; to put the part at rest, and to approximate and appose the fragments. The latter function is much better performed by internal splints, whilst the external splints keep the part at rest and enable the internal splints to do their work.

I. FRACTURES OF THE SHAFTS OF BONES

The Femur.—Under this heading will be considered fractures of the shaft of the femur about its middle. The first question to be asked is, "Are the results of treatment by the older method of external splintage satisfactory or not?" The St. Thomas' Hospital Reports are the only reliable sources of information which are available. The Reports are compiled by writers who are absolutely unprejudiced, so that these records are, with their limitations, probably the most truthful and impartial which are extant.

During the years 1894 to 1905 the Surgical Reports have been compiled by Mr. Cuthbert Wallace, Captain Owen Thurston, Mr. H. J. Marriage, Mr. Edred M. Corner, Mr. P. W. G. Sargent, Mr. C. A. R. Nitch and Mr. J. E. Adams. During their periods of office as Surgical Registrars 695 cases of fractures of the shaft of the femur were admitted and of 307 of these, reliable information is given:

22 per cent. or 68	are definitely stated to have had no shortening after treatment
8 " " 25 " " " " " "	$\frac{1}{4}$ of an inch or under of shortening
28 " " 86 " " " " " "	$\frac{1}{2}$ of an inch of shortening
13 " " 39 " " " " " "	$\frac{3}{4}$ " " " "
17 " " 51 " " " " " "	1 inch of shortening.
1 " " 4 " " " " " "	$1\frac{1}{4}$ inches of shortening.
5 " " 14 " " " " " "	$1\frac{1}{2}$ " " "
2 " " 7 " " " " " "	$1\frac{3}{4}$ " " "
3 " " 9 " " " " " "	2 " " "
1 " " 4 " " " " " "	$2\frac{1}{4}$ " " "

From these results it will be seen that 22 per cent. had a leg with no shortening and that 88 per cent. had up to one inch of shortening. The mortality was 15 for the 695 cases, just over 2 per cent., the fatal issue being due almost invariably to delirium

tremens or some complicating injury. From these figures, 88 per cent. with less than an inch of shortening and an all-round mortality of 2 per cent., it is quite obvious that treatment by means of internal and direct splintage will have a very uphill task to improve on the old method of external indirect splintage. Still it is definitely proved that in 12 per cent. of cases of simple fracture of the shaft of the femur the older treatment is unsatisfactory, and it will remain for the more modern treatment to be useful in these 12 per cent. of cases. Thus it will be seen that the modern method of the treatment of fractures will not find frequent application in fractures of the femoral shaft.

Operative treatment has shown us that many of our ideas of the anatomy of these cases was wrong. For instance, transverse fractures, such as were stated to occur in fractures of the shaft of the femur of children,—like the fracture in the breaking of a carrot,—have been found to be infrequent, and the oblique fractures of the femur of adults has been found to be spiral in the very great majority of cases. In fact, the irregularities of the strength of the various parts of the shaft of the femur lend themselves to irregular lines of fracture, which are spiral rather than transverse or truly oblique.

The first slide * shows the bones in a case in which there had been a separation of the upper epiphysis of the femur. The accident had occurred some time before the boy was admitted to St. Thomas' Hospital. He was unable to do his work as a sailor. An operation was undertaken, the neck of the femur exposed and the fragments cleared, a screw was then driven upward through the trochanter into the head of the femur but could not be driven "home" for fear of fixing the femur to the acetabulum. After the operation the boy did extremely well and in a few months returned to his work, the screw remaining in the bone and giving no trouble.

The next two slides show the condition before and after operation of a little boy who broke his femur obliquely and spirally in the middle of the shaft. The fracture was an extremely easy one to fix by means of a screw and a plate bearing two screws so that a most excellent result was gained.

* The lecture was illustrated throughout by lantern slides.

The next slide shows an oblique spiral fracture of the femur with very considerable displacement of the fragments which are not even touching one another. The case is most interesting and instructive. It is that of a little boy who broke his thigh, which was put up in a plaster of Paris dressing, and, I believe, under an anæsthetic, at one of the large teaching hospitals in London. Not having a bed in which to put the child, the officers to that hospital telephoned to us at the Hospital for Sick Children, Great Ormond Street, to ask if we could take the child in, adding that the leg was already in plaster and would give no trouble. We took the case in and were at once struck with the apparent inequality of the legs. A skiagraph, taken through the plaster showed that the shortening was due to overlapping of the fragments which were not even in apposition. A truly surprising state of affairs to be the result of the work of officers in a large and reputable institution! The fracture was subsequently operated on by Mr. W. Arbuthnot Lane who secured the fragments in proper position by means of internal splintage with most excellent results.

This case shows that the treatment of fractured femur by means of plaster of Paris may fail completely, and even in competent hands. It is such cases as that just narrated which help to form the 12 per cent. which we found to be the number of cases at St. Thomas' Hospital in which *external and indirect splintage* was unsatisfactory and should have been supplemented or replaced by *internal and direct splintage*.

The next slide shows a transverse fracture of the femur with the fragments fixed in apposition by means of a plate with three arms each being perforated by a screw.

The Tibia.—Fractures of the shaft of the tibia give excellent results when treated by the older method of indirect splintage by means of external splints. But the more oblique the fracture the more easily do the fragments slip on each other and the more difficult are they to hold in position by external splints. These oblique fractures which are the result of indirect violence, occur in the lower third of the tibia and are accompanied by an oblique fracture in the upper third of the fibula. In fact, the more oblique the fracture of the tibia, the more widely is it separated by the accompanying fracture of the fibula. It is in these extreme cases

FIG. 1.



Skiagraph of bones taken shortly after operation whilst the leg was in plaster of Paris splint. Note that the four screws are more or less parallel and the plates are in contact with the bone.

FIG. 2.



Skiagraph of the bones of the leg taken after the plaster splint has been removed, six weeks after the operation. Note that the screws are no longer parallel and that one plate is tilted so that its upper end is not in contact with the bone any more.

only that the modern practice of internal splintage is likely to replace the older method and yield better results. Lantern slides of such a case are shown as an example of how, by internal splintage, the shape of the bone may be almost perfectly restored. The operation is much more simple on the tibia than on the shaft of the femur because of its superficial position and easy exposure.

The case used to illustrate the internal and direct splintage of an oblique fracture of the tibia is that of a young man who slipped and broke both bones of his leg by indirect violence. The tibia was broken in its lower third and in its upper third; both lines of fracture were very oblique. After the man had been in the hospital a few days, Mr. F. M. Nield, the house surgeon told me of the impossibility of keeping fragments of the tibia in apposition with external splints not applied so tightly as to interfere with the circulation of the limb (Fig. 1). Moreover, he stated that the sharp end of the upper fragment seemed very likely to perforate the skin and become compound. Operation was undertaken and the fracture of the tibia exposed, the fragments were manipulated into position and held there by means of two large Lane's forceps. Two steel plates were then placed over the fracture and maintained in position with four screws. The wound was closed and the leg immobilised in a plaster splint. Union took place by first intention. A skiagraph taken shortly after the operation, through the plaster splint, shows the two plates and the four screws which hold them more or less parallel to each other. The next slide made from a skiagraph taken about six weeks after the operation shows that one plate has become loose and has tilted, making one screw tear its way through the softened medulla of the bone, so that it is no longer directed similarly to the other screws. Three or four months later it became necessary to remove the plates, when it was found that both the screws *distal* to the fracture had become loose and were easily lifted out of their sockets; whilst the two screws proximal to the fracture were tight and had to be unscrewed (Fig. 2).

This is a curious observation and suggests possibly that some constitutional disturbance, possibly vascular but more probably nervous or trophic, has weakened the metabolism of the part, lessening the resistance and capability of repair in the fragment which has been severed from its vascular and nervous supply by the line of fracture.

That such a condition should be brought about by the fracture is by no means surprising if one pause to think about it. In fact, it is almost as unreasonable to expect perfect vascular and nervous influences in an amputated limb as in a fragment separated by fracture from its parent bone. Hence in applying internal splints to a broken bone it must be expected that they will hold less well in the fragment which has been separated from its vascular and nervous connection than in the other. Moreover reparative changes in the "insulated" fragment may lead to some superficial necrosis round the screw. In the case narrated the limb remained in plaster after operation for five weeks, during which period there was absolutely no pain, discomfort or fever. The wound healed but later opened at one part where a sinus formed leading to the plates. About four months after the operation the plates were removed by Mr. M. Huggins and about a month after that, whilst at a convalescent home, a spicule of bone came away, about as long as the screw which came from the lower and distal fragment. I would suggest that this was either a case of aseptic necrosis in the lower fragment due to its insulation from its nervous and vascular supply, as the upper fragment underwent no necrosis; or that *Staphylococcus albus*, which has so much to do with the repair of a part, may have been concerned in the necrosis of a layer of bone in the insulated fragment.

The Humerus.—Internal splintage is sometimes required in fractures of the shaft of the humerus. But in the majority of cases excellent union results from the older method of treatment by external splintage. But here, as in the case of the shaft of the femur, we have learned that the lines of fracture are not simple as hitherto taught, but complicated. In the arm, free and extensive movement is much more important than it is in the leg, where stability is the prime requirement. As internal splintage allows of correct union taking place between the fragments, whilst by massage and movements free mobility of the joints can be secured, it is obvious that its use for fractures of the arm will be more frequent in the future than it is now. This is much more true of the forearm bones, the radius and ulna, than of the humerus. Union after fracture if accompanied by deformity must affect the power and extent of rotatory movements of the forearm when the

radius and ulna are affected. Upon these rotatory movements to a great extent depend a man's or woman's skill in work, particularly finer or special work. Hence the retention or saving of these movements is often a matter of the greatest importance to the unfortunate persons who have broken their arms. Thus there can be no doubt that the application of direct and internal splintage to the bones will be much more frequently practised in the future for fractures of the forearm bones in women, skilled workers and amongst the upper classes than it is at present. In order to give some idea of the work which has been done already in this connection slides of three cases are shown.

1. The first slides show the result three months after operation of a little girl in Great Ormond Street, who broke both bones of her forearm which united with the ulnarward deformity unfortunately so commonly seen. The result was that the bent radius came in contact with the bent ulna and interfered with rotatory movements. To have waited to see if the natural growth of the bones would have restored their proper anatomical shape would have meant the loss of much of the education of her arm in skilled movements. It was therefore decided to divide and reset the bones. This was done and the bones straightened. To do this it was necessary to resect a small portion of the radius. The fragments were then plated with two screws and a dumb bell-shaped plate (Fig. 3). There was a gap about one-third of an inch wide between the ends of the fragments of the radius, owing to too much of the bone being resected. If the skiagraphs taken three months after the operation are examined it will be seen that this gap has been filled up with bone and that the uppermost screw, driven tightly at the operation, has become loose and half out of its socket. The child who has an excellent arm suffers no inconvenience from the displaced upper screw which is still in the arm.

The second case is unfortunately not an uncommon condition, an undiagnosed Colles' fracture which was impacted with so much deformity that the hand was disabled. The case was that of a woman, forty to fifty years of age, who had fallen some two months previously on her right hand. Her injury was followed by so much pain and swelling that it was impossible to make a diagnosis. When the swelling had gone down and a diagnosis was made it was

impossible to disimpact the fragments. The hand was very much disabled, particularly by the deviation to the radial side, which completely prevented her from writing or sewing. Under these circumstances operation was recommended and accepted. An incision was made over the dorsum and the radius divided just above the line of impaction with an osteotome, as it was impossible to separate the fragments at the line of impaction. The deformity was reduced, the wound sutured and a splint put on. This operation was a failure because the posterior radio-carpal ligaments had shortened and, when the hand was pulled straight, they tilted the lower fragment of the radius so that the surface of the divided bone was turned towards the dorsum of the arm and bony union was impossible. Under these circumstances a second operation was undertaken, which was very difficult to do, and the two fragments fixed in position by means of a steel plate and two screws of unequal length, the longer being used at the lower part. This left a gap of a third to half an inch between the fragments, the result of the impaction at the time of the injury. The skiagraph, from which the slide was made, was taken four months after the operation, and shows, as in the previous case, that this gap had been filled up with bone. The woman began writing a fortnight after the operation and has now a very good arm.

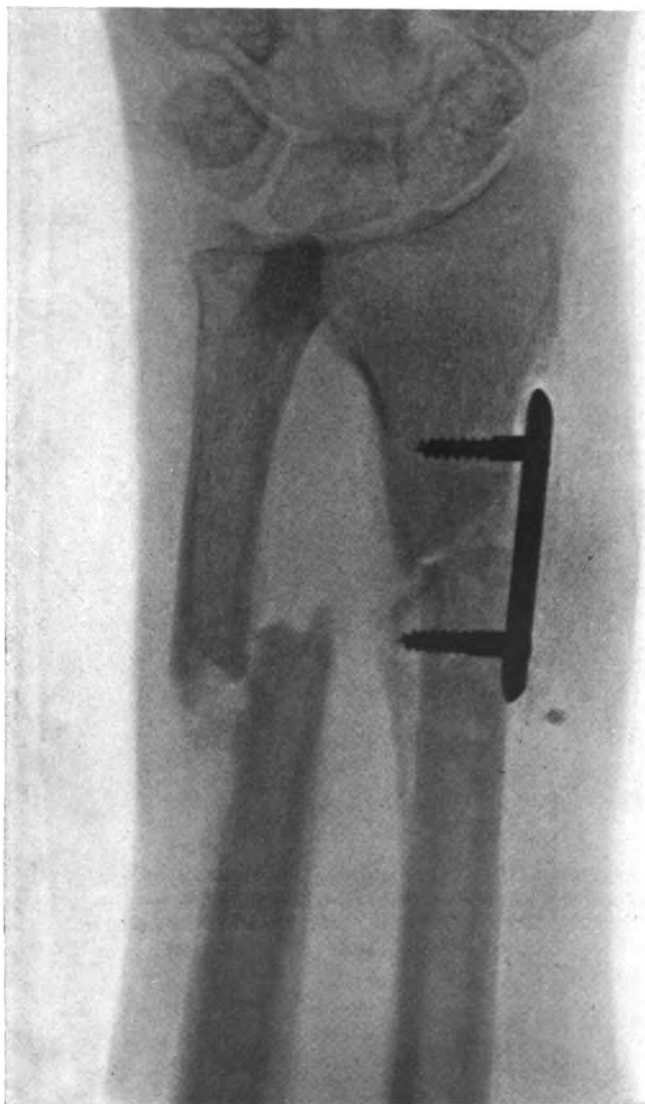
This case is that of a chauffeur whose arm was broken by "backfire" when turning the starting handle of his car (Fig. 4). The resulting deformity was so great that operation was recommended to enable him to resume his occupation. An incision was made over the radial side of his arm, and the fragments fastened in position by a steel plate and two screws. The ulna was left alone. The skiagraph, from which the slides are made, were taken a few days after the operation. The first shows the radius in excellent position. Too long an upper and too short a lower screw have been used, the latter of which has not been driven home. The consequence of these points is seen in the next slide taken from a skiagraph of the arm in another position. The screws in the radius have failed to fix the fragments, which have moved on each other. Both skiagraphs show that it was wrong to leave the ulna alone. The fragments should have been joined, as they have been subsequently. The man has returned to his work and has an excellent arm.

FIG. 3.



Skiagraph of the forearm bones of a little girl who had her radius plated, taken some months after the operation. At the operation a space the third of an inch was left between the fragments of the radius which was filled by bone when this skiagraph was taken.

Fig. 4



Skia-graph of the bones of the forearm of a chauffeur after the first operation.

The next slide is from a tracing of a bad skiagraph of the result of wiring the humerus. It was a case of comminuted fracture of the lower end of the humerus of a man, the result of a bicycle accident. There were three largish fragments exposed at the operation when it was decided to wire the more important of these together. This was done and a skiagraph taken a week after the accident from which the tracing was made (Fig. 5). The man has an excellent arm so that the slide is not as bad as the skiagraph makes it appear. What has happened is this: the two fragments

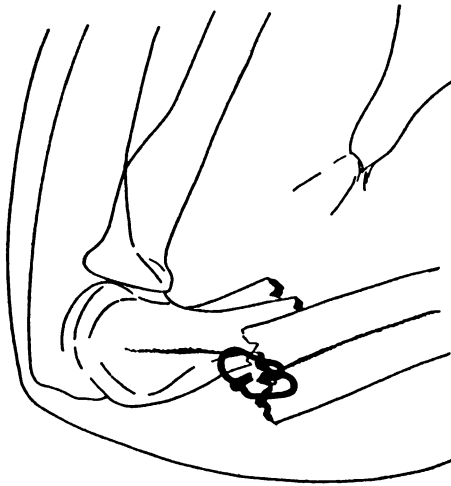


FIG. 5.—Tracing of a skiagraph which was too dense to use for reproduction. Note that fragments are united by a wire which has formed a fixed point on which the fragments have rotated.

have been wired together at their outer angles forming a fixed point about which the lower fragment has rotated on the upper about twenty degrees, completely hiding in the skiagraph the third fragment. The final result is quite good but the lesson taught is that at least three fixed points are necessary to maintain an object stationary in space. And its clinical application is that at least two internal splints should be used when operating on the shaft of a long bone.

II. FRACTURES IN THE NEIGHBORHOOD OF JOINTS

(Reference was then made at length to the treatment of fractures of the olecranon at the elbow and patella at the knee by means of internal splints.)

There is another joint, besides the elbow and the knee, which has a common fracture in connection with it; namely, the ankle-joint. The fracture is called a Pott's fracture and is a fracture-dislocation at the ankle-joint with displacement of the foot outwards and backwards. Now this injury is of prime importance because there is hardly another, compatible with life and general health, which takes away such a large percentage of the working value of any man. Where a man, and perhaps his wife, family and home, depends on his physical ability in order to perform his work and gain his livelihood, such as do patients of the hospital class, a Pott's fracture is a most serious injury. His earnings are likely

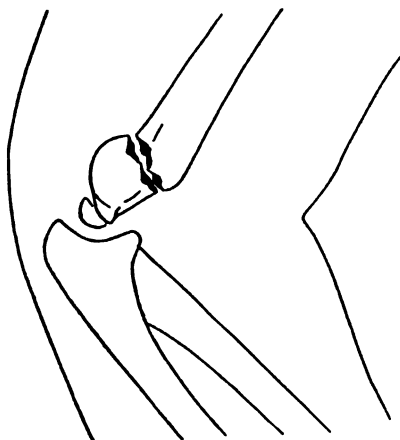


FIG. 6.—Tracing of skiagraph of the bones before operation showing the displacement.

to drop over 50 per cent. It is therefore a welcome aid if anything can be done to minimize the trouble which is so apt to follow upon this injury.

Modern surgery has done much by massage and manipulations. Can operation do much? The first point in the treatment of these cases is to reduce the displacement of the foot in both outward and backward directions. If this can be done satisfactorily, the limb can be put into a plaster of Paris splint and treated later by massage and manipulations. One or two skiagraphs should be taken in different directions whenever the X-rays are available; attention being directed to the internal malleolus, the lower end of the fibula and the astragalus, in case of the two

former to see if they have been restored to proper position after the fracture; and last, to see if there is any rotatory dislocation of the astragalus. The obstacles to the complete reduction of the deformity of a Pott's fracture are, in the main, of three classes: fibular, such as the fragments being impacted or caught in the peronei muscles; tibial, where the internal malleolus or torn ligaments get between the astragalus and the tibia; astragaloid, particularly rotatory dislocations of the astragalus on its anteroposterior axis. Therefore the modern treatment of these fractures demands two incisions, one on either side of the leg to examine for tibial and astragaloid factors. The sooner such an operation is undertaken the greater the chance of its success. When undertaken late the operation demands both incisions, much care and its measure of success is uncertain. Its objects are threefold: to restore the astragalus to its proper place, to fix the internal malleolus or the lateral ligament, to restore and fix the broken fibula. I am sure that if only operation was undertaken more frequently in these cases there would be far less disaster after the injury.

Reference has been made previously to the St. Thomas' Hospital Reports as the most excellent records published by any hospital and as a mine of information in which no enquirer need search without finding valuable statements. During my Surgical Report in 1900 and since then some particular records were kept until 1906 when they were discontinued. For these six years the figures are given:

Total number of cases of Pott's Fracture.....	146	
Total number of Fractures, compound.....	3,	Approximately 1 in 50, 2%
Total number of Re-fractures	1,	Approximately 1 in 150, 6%
Total number of cases in which		
(1) The internal malleolus was broken	98	} Approximately 3 to 1, 75%-25%
(2) The internal lateral ligament was torn	38	
(3) The right leg was injured	60	} Approximately 3 to 4
(4) The left leg was injured	86	
(5) The subjects were male.....	92	} Approximately 9 to 5
(6) The subjects were female.....	54	

It will be particularly noticed that the internal malleolus was broken three times as often as the internal lateral ligament was torn, that Pott's fracture is unusual among injuries in the left side of the body suffering more frequently than the right.

III. FRACTURES WITH ONE OR BOTH SMALL FRAGMENTS

Only a very brief time can be devoted to the third section,—when one of the fragments is too small or too thickly covered by tissues to be held in position by any splint applied externally and indirectly. In this class would be placed fractures of the surgical, morphological and anatomical necks of the humerus, supracondyloid fractures of the humerus, fractures of the neck of the radius, fractures of the base of the metacarpal of the thumb, some fractures of the clavicle, fractures of the neck of the femur, subtrochanteric and supracondyloid fractures of the femur, separation of the tubercle of the tibia, fractures of the calcaneum, some fractures of the spine, jaws and pelvis. Thus it will be seen that all fractures are included in this section as demanding the direct application of internal splints where external and indirect splintage is unsatisfactory. It is a matter of general experience that fractures of the neck of the humerus usually get quite well and give excellent arms when treated by external and indirect splintage. Therefore direct and internal splintage is only required from time to time. But should it be required the earlier the decision is made the better for the patient and for the result which can be obtained.

The case, whose slide is shown, does not illustrate so much the use of internal splints as the benefit to be derived from operation in suitable cases. In 1901 the boy fell and broke his arm transversely above the condyles. External splints were used in the casualty department but on their discontinuance the lower fragment was found still so much displaced backwards as to make it impossible to flex the arm to a right angle. Operation was undertaken to wire the bones but unfortunately the epiphysis was split whilst doing it. It was therefore decided after separating the scarcely united fragments, to replace them in good position and apply external splints. The result was most gratifying, the lower epiphysis uniting with the shaft of the humerus, only a shade displaced backwards, and the boy has acquired full use in his elbow. After the lapse of six to seven years it is instructive to find that the splitting of the epiphysis has had no deleterious effect on the movements of the elbow-joint or on the growth of the bone.

ADENOMA OF THE THYROID GLAND

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A CLASSIFICATION of those intricate tumors of the thyroid gland commonly called "goitres" must be sufficiently simple to embrace in the separate divisions nearly all of the enlargements seen clinically. It must also be elastic enough to include with reasonable accuracy the various types observed by gross and microscopic examinations. Virchow's division, based on macroscopic appearance, into hyperplastic, fibrous, colloid, cystic and vascular is not satisfactory; while Wolfler's scheme is artificial and entirely too complicated for general use.

No arrangement can be perfect until the physiology of the thyroid gland and the general laws of tumor growth are more clearly understood. The following is used in the Surgical Laboratory of the University of Pennsylvania: *

1. Benign goitre
 - (a) Simple colloid goitre
 - (b) Adenoma
 - (c) Cysts
2. Malignant goitre
 - (a) Carcinoma
 - (b) Sarcoma
3. Exophthalmic goitre

The symptom-complex of the group of diseases known as Thyrotoxicosis (Kocher), Grave's, or Basedow's disease is well known to the clinician and the characteristic histologic changes

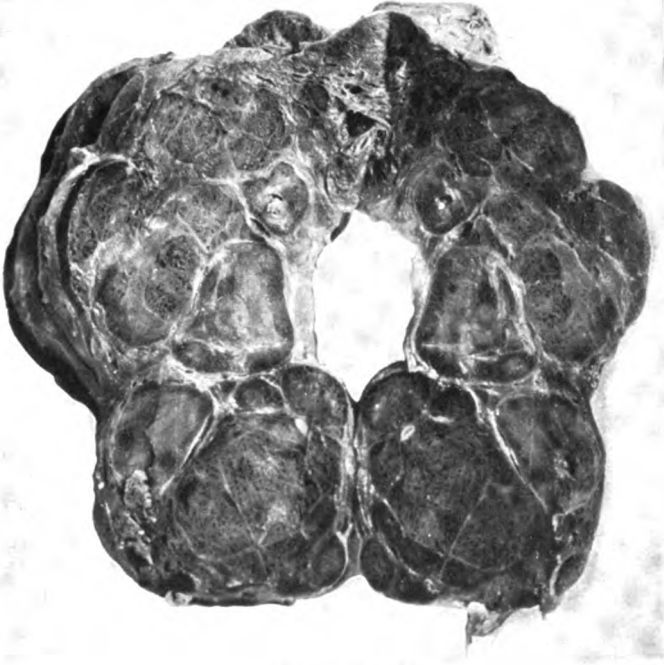
* From the opening of the Surgical Laboratory in 1902 up to July 8, 1908, we have received 39 tumors of the thyroid gland, of which 14 may be classified as simple colloid goitres, 10 as adenomatous goitres, and 5 as exophthalmic goitres. There are also 6 carcinomata, 3 sarcomata and 1 cyst in the collection. Of the adenomata, 5 were of the colloid, 3 of the fetal and 2 of the papilliferous varieties. These ten specimens were removed by Drs. Frazier, Martin and one by the writer. I have also studied about forty specimens of thyroid tumors removed in the German Hospital by Dr. John B. Deaver.

are equally well known to the pathologist. The separate types of malignant disease are difficult to distinguish clinically although easily recognized from the gross or microscopic specimens. But benign goitre has given rise to the confusion existing in regard to nomenclature and it has seemed to be better to group the different types diagnosed in the wards as "goitre" instead of placing simple goitre among hypertrophies and adenomatous goitre in the tumors. Kocher recognizes this in his recent paper and simply divides goitre into an enlargement affecting the entire gland—*diffuse goitre*,—or only a part of the gland,—*nodular goitre*. I had adopted this arrangement in teaching surgical pathology years ago but used the terms *bilateral* and *unilateral* goitre, those used by Kocher, however, being preferable.

SIMPLE COLLOID GOITRE is a diffuse enlargement of the thyroid gland generally supposed to be due to some alteration in the secretory or resorptive function presumably caused by peculiarities of drinking water. It is the variety most common when the disease is endemic. Puberty, menstruation or pregnancy may be said to cause a physiological hypertrophy at times and its growth is influenced by conditions causing venous stasis or by an abnormal situation of the gland. The symptoms are well known and in addition to the disfigurement caused by the growth, are due to mechanical pressure on the trachea, œsophagus, nerves or blood-vessels. Fibrous, calcareous or vascular goitres are dependent upon secondary changes for their occurrence and do not require to be discussed separately.

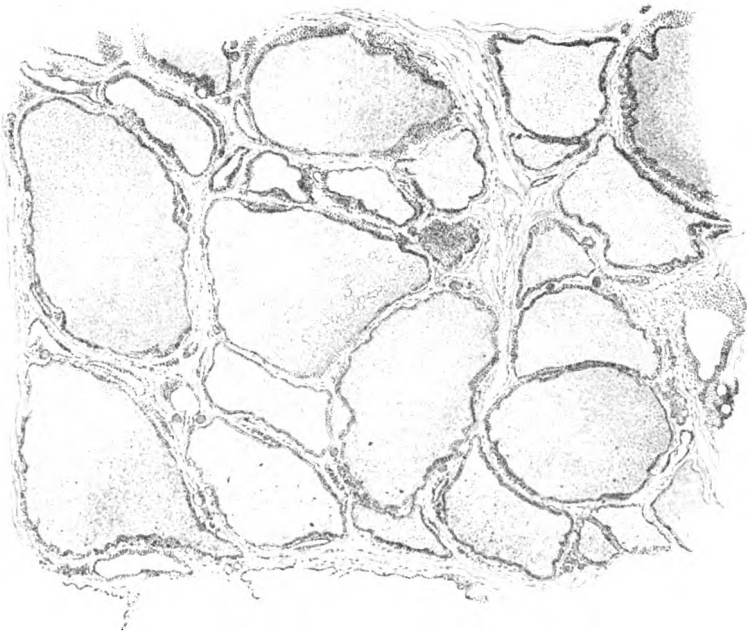
When removed, a simple goitre (Fig. 1) resembles the shape of the normal gland, although one lobe, usually the right, may be the larger. The external surface is lobulated and covered with a thin capsule in which large and tortuous blood-vessels may be observed. The section surface is yellowish-brown or reddish-brown in color, is soft, spongy and sticky and the distended vesicles are usually plainly visible. Areas of hemorrhage, small cysts, masses of colloid, calcareous nodules or a fibrous over-growth may be perceptible. Microscopically (Fig. 2), such a goitre consists of large vesicles lined with a single layer of cuboidal epithelium and containing the colloid substance staining red with eosin. The connective-tissue

FIG. 1.



Simple Colloid Goitre.

FIG. 2.



Simple Colloid Goitre (microscopic drawing).

is fairly abundant, contains the blood-vessels and lymph-channels and frequently in old goitres evidence of an inflammatory reaction.

In some areas distinct hyperplasia may be observed, which must be carefully distinguished from malignancy. I believe that such areas are evidence of growth of the "interstitial epithelium" into irregular acini to compensate for the loss of function of acini whose epithelium has been flattened out and practically destroyed by the pressure of the colloid exudation. Such regeneration is taught in the case of loss of glandular structure after partial thyroidectomy and is just as certainly probable in the old parenchymatous hypertrophy. These areas are often described as adenomatous masses thus greatly confusing the understanding of the microscopical appearance of benign goitres.

Treatment of Simple Colloid Goitre.—Surgical intervention should be resorted to when the tumor is rapidly increasing in size, occupies an abnormal position, causes pressure-symptoms, or has existed for any length of time. Medicinal treatment may be tried in young women and is often attended with success. It consists in the administration of iodine or, what amounts to practically the same thing, the use of preparations of the thyroid gland itself. The drug is usually administered in the form of potassium or sodium iodide and may be increased up to 50 grains daily, but its effect must be carefully watched as emaciation may be produced. A careful investigation of the patient's habits and digestive organs should be made and any irregularities corrected, often a change of drinking water being beneficial especially when goitre is endemic. It is useless to hope for cure in old, hard goitres or where cystic degeneration has developed. Iodine should never be injected into the gland as nearly twenty cases of death have been reported from such treatment.

Despite the title of this paper I have considered the simple hypertrophy at such length merely to emphasize the points wherein it differs from the thyroid adenomas, because while both seem best considered as benign goitres yet there are certain distinctions between them which are vital to successful treatment of this group of thyroid enlargements. The nodular and usually asymmetrical tumors must be treated surgically because the danger of malignant transformation is so great and the prognosis of cancer of the

thyroid so hopeless that delay in many cases will lead to an impossible attempt at removal.

It, therefore, behooves us to learn now to distinguish between the several forms of benign thyroid enlargements with greater accuracy than is usually done in general practice and in the clinics.

ADENOMATOUS GOITRE.—This type of thyroid tumor (Fig. 5) is a localized nodular hypertrophy of the thyroid acini or a proliferation of new acini and tubules, in either case so closely resembling an adenoma as to be indistinguishable grossly or microscopically. As will be seen later, this goitre can be easily subdivided into several varieties but with one exception, such distinction is of little importance from the diagnostic or operative standpoint. While usually a single asymmetrical tumor in the thyroid gland there may be multiple masses, or the growth may be close to but outside the thyroid body.

Clinical Etiology.—While the onset of some of these goitres can be traced to puberty or to a pregnancy such is by no means the rule and while it is generally stated that the variety known as "fœtal adenoma" is especially likely to be first noted at the time of puberty I have not found it so in our three cases. Most of the adenomata certainly do occur in females, Bloodgood stating that all of his twenty-five specimens were removed from women and Beilby records only one of nine cases where the growth occurred in a male; all the specimens in our laboratory were removed from women. The age of onset is almost invariably under 30 and at operation the average age will be found to be somewhere in the thirties though in the University Hospital our patients have been somewhat younger than those recorded by other observers.

The tumor is situated in one or the other of the lobes, usually the right, and only rarely occupies a situation close to but outside the thyroid proper in which case it has of course arisen from some accessory tissue. This phenomenon is also occasionally observed in the mammary gland.

In one of our cases the adenoma (S. P. No. 1160) occupied an abnormal position being removed from behind the upper border of the sternum and attached to the lower pole of the right lobe. In this case there was also a large adenoma occupying the left

lobe and dating from a pregnancy 12 years before, the patient being 38 years of age.

When removed and examined an adenoma may, if small, be seen as a nodule within the thyroid tissue but in the majority of specimens the normal gland merely exists as a thin capsule or shell, the tumor occupying the entire lobe. These growths may exist for years and grow extremely slowly, only in rare instances do they attain any large size in a year or less.

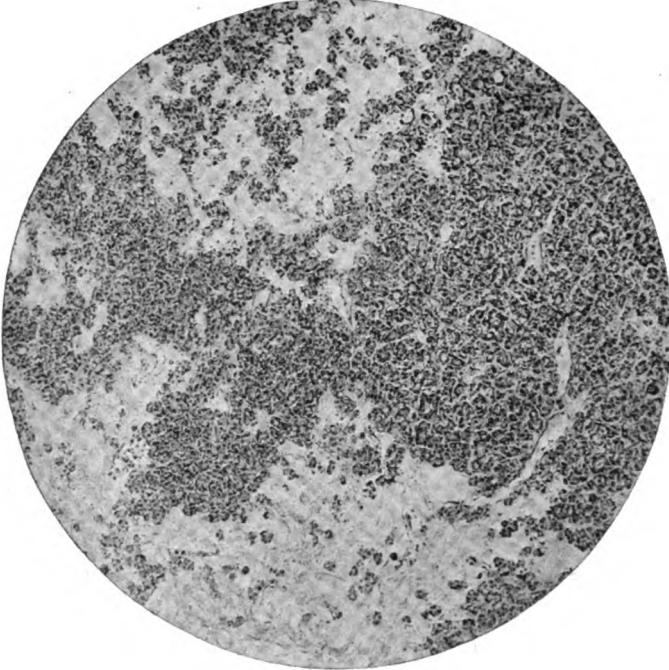
Symptoms.—The one characteristic of the adenoma is *tumor*, firm, freely movable and only rarely pressing upon the trachea or œsophagus sufficiently to cause dyspnœa or dysphagia. The mass is almost invariably situated to one or the other side and this can easily be demonstrated in doubtful cases by swinging the tumor with the hand to one side and observing the middle line. In several of our cases a mild degree of aphonia was present and in several others some pressure was exerted upon the blood-vessels of the neck but never to a severe degree. In most of the patients a history was obtained indicating a slight degree of thyrotoxicosis, either in the form of tremor, circulatory disturbances or general nervous manifestations and I have come to look for these in all unilateral goitres and to differentiate them carefully from true Basedow's disease. Such phenomena must be due to a vicious activity of the cells of the adenoma and is further analogous to exophthalmic goitre when the small amount of the colloid content in both lesions is considered.

When a sudden increase in the size of the tumor takes place it is probable that hemorrhage has occurred; such an occurrence is usually followed by the formation of a cyst because the blood sifting between the acini isolates them and by compression and the admixture of escaping colloid with the serum a cavity is formed containing a brownish or rarely a clear fluid (Fig. 5). Cysts rarely form in the variety known as fetal adenoma. Occasionally the gland throbs or conveys a thrill to the hand indicating excessive vascularity, with much bleeding at operation and a very hemorrhagic goitre when removed. Finally, an increase in size, the goitre becoming harder, nodular and adherent, indicates malignant disease and the prognosis is practically hopeless.

Pathological Varieties of Adenoma.—When specimens of thyroid adenomata are examined in the laboratory they can usually easily be placed in one of three groups, those which are granular, dry and yellowish in color, those which are fleshy, pink in color, sticky to the feel and contain areas of hemorrhage, and those which are shaggy, rough and friable. When examined microscopically the first group reveals the structure of the foetal thyroid gland and hence has been termed *foetal adenoma* (Fig. 3). The vesicles are solid, closely packed together and contain practically no colloid. The individual cells are well formed, stain well and are small without any evidence, however, of compression. The connective-tissue stroma is very scanty and sometimes replaced by a colloid or mucoid substance between the vesicles which separates the acini into islets or scattered masses. Wolfer described these adenomata, when infiltrated with a mucoid-like substance, as *adenoma myomatousum* (Fig. 4). The blood-vessels are abundant and very thin-walled and seem to be derived directly from the surrounding normal compressed thyroid gland. In some areas masses of cells may be observed without the shape or enveloping membrane of a vesicle. Usually an isolated vesicle may be found in each field where colloid secretion has occurred distending the vesicle and resembling the normal structure except that the cuboidal cells are more plump in appearance.

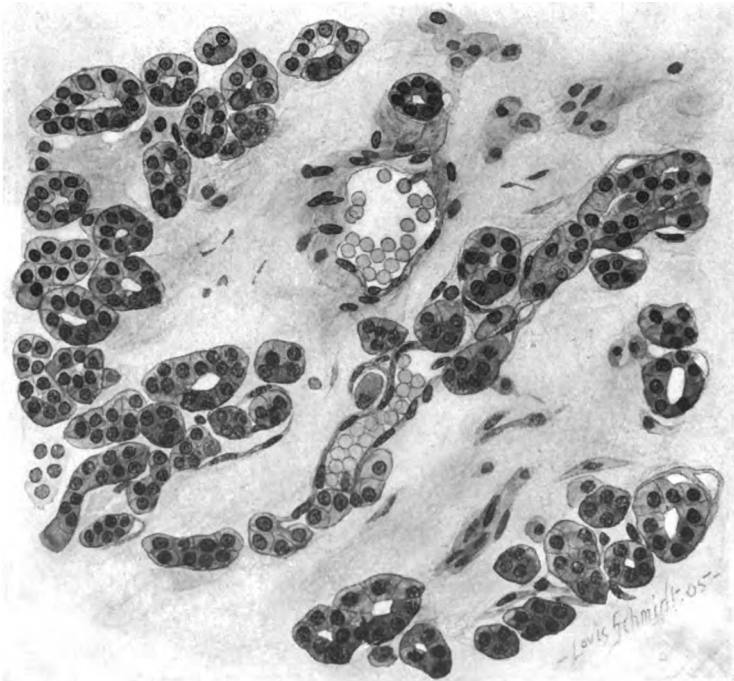
The second group may be termed, *colloid adenoma* (Fig. 6) because, while the microscopic picture shows distinctly a hyperplasia of the thyroid cells into vesicles shaped as in the normal gland, yet they are filled with the colloid secretion. In many areas the foetal structure is apparent and so formerly I termed these "*mixed adenomata*" but the other term seems more descriptive. Such tumors are naturally larger in size than the foetal adenomata and are often distinguished with difficulty from the simple hypertrophy by those who have not followed the removal by operation with a careful gross and microscopic examination. After a little experience it is easy to separate a slide containing a section removed from one of these groups from a slide showing parenchymatous hypertrophy, and if the gross specimen and microscopic section are examined together the diagnosis is extremely easy.

FIG. 3.



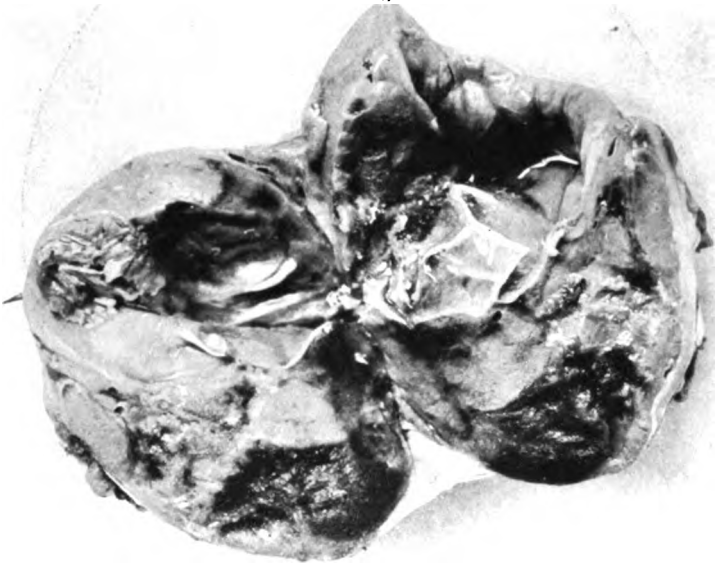
Fœtal adenoma (low power).

FIG. 4.



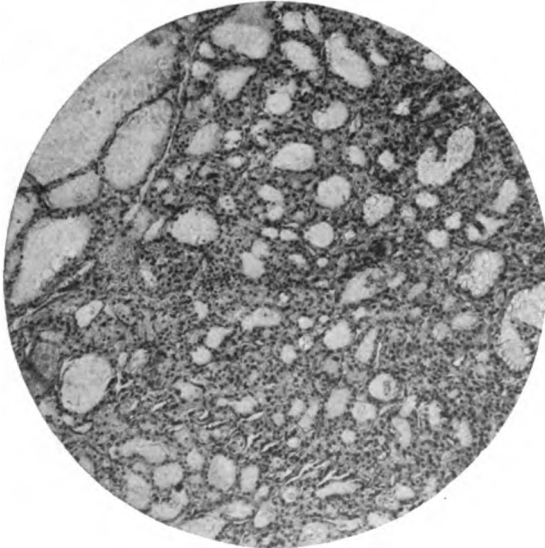
Fœtal adenoma (high power).

FIG. 5.



Colloid adenoma with hemorrhage and cyst.

FIG. 6.



Colloid adenoma.

The following points of differentiation are given by Beilby * and express succinctly the appearance of the types:

a. "As to the epithelium lining the vesicles: In the adenoma we find the cell tending to a columnar character, while in the hypertrophy the cells appear more compressed and assume the appearance of a cuboidal type.

b. As to the contents: Colloid. In the early adenoma, epithelial tissue is the one tissue present. Small amounts of colloid are visible, but this is not seen in appreciable amounts until a later stage. In this later stage the colloid is increased markedly in amount, and approaches as to quantity the amount which is visible in the hypertrophied gland. Besides this colloid material, which in certain amounts is normally present, the alveoli may also contain desquamated epithelium and red blood cells. In the colloid adenoma there is usually present a large number of epithelial cells within the alveolus, which stands in marked contrast to the hypertrophy where no desquamation is evident. Again, in the adenoma small hemorrhages into the alveoli are more common.

c. As to stroma: In the adenoma scarcely any connective-tissue stroma is visible, the vesicles with or without colloid material are closely packed together. In the hypertrophy, however, while a number of vesicles containing considerable colloid are in close proximity, being separated by small amounts of connective-tissue, the groups of vesicles are isolated and between these groups dense and rather large amounts of connective-tissue are visible."

I have noted in at least two of our specimens that the cells are very high and suggest, in a few areas, the "infolding" seen in the exophthalmic hypertrophy. Tracing those cases back to the clinic I found that the patients suffered from tremor and were considered as cases of thyrotoxicosis of mild grade, probably the type often described as pseudo-Basedow's disease. The mucoid infiltration, considered by Wolfier to be due to the rupture of the follicles and the escape of the colloid into the interstitial tissue, is sometimes seen in these as well as in the foetal adenomata. I am inclined to believe that such an occurrence is in intimate relation to hemorrhage and is a forerunner of cyst-formation.

* Beilby, *Annals of Surgery*, June, 1906.

The *papilliferous cyst adenoma* (Fig. 7) is an uncommon variety which is important because of its close relation to carcinoma. It was first carefully described by Wolfler in 1883, and in 1903 Low was able to collect but nine cases from the literature, but, as he added six and I have observed four, it is probable that this type is not so rare as commonly supposed. Microscopically (Fig. 8) there are observed large and small cystic spaces surrounded by dense connective-tissue and containing intricately formed branched papillary processes lined by a columnar epithelium. The stroma may be myxomatous. Occasionally this tumor gives metastasis, or recurs locally after removal and should therefore be considered as mildly malignant; in a case recorded by Barker the patient underwent many operations during eighteen years for recurrence; care should be exercised in removing such a growth to avoid dropping pieces of the tissue in the wound.

Treatment of Adenoma.—This form of goitre should always be subjected to early operative removal, because from the very nature of the tumor it is obvious that medical treatment would be futile. This is particularly true of those nodular goitres where softening, cyst-formation or hemorrhage has occurred, when symptoms suggestive of hyperthyroidism are present, when pain or pressure effects are experienced or where from the situation of the adenoma growth into the thorax may occur. There is always the possibility of malignant transformation at a later time and "for this reason, every asymmetrical enlargement of the thyroid gland should be subjected to immediate operative removal" (Bloodgood). The operation is simple, can be easily and rapidly performed and should not endanger the nerve or parathyroids if ordinary care is exercised. Local anæsthesia with cocaine and adrenalin, novo-caine, etc., may suffice, but as most of these goitres are of moderate size without pressure-symptoms, general anæsthesia when given carefully will be found more easy and result in better healing of the wound. The trunk and head should be elevated by the reversed Trendelenburg position and a small sand pillow placed under the shoulder to make the neck more prominent. The usual Kocher incision is then made and the flap containing the skin, fascia and platysma dissected up, ligating the anterior and oblique jugular veins if necessary. The sternothyroid and

FIG. 7.



Papilliferous cyst-adenoma.

FIG. 8.



Papilliferous cyst-adenoma (low power).

sternohyoid muscles and deep fascia are then split in the mid-line and retracted, though if the tumor is large more room may be obtained by dividing the muscles at the upper border of the adenoma. The thyroid is thus exposed covered with its capsule in which large accessory veins may be seen and in color a dark red. The adenoma is always covered by a thinned portion of the gland and will not be observed at once. Several methods of procedure may now be adopted, viz., excision, resection, enucleation or combinations of these. The superior and inferior thyroid vessels may be exposed and ligated, the gland dislocated out of its bed and the isthmus crushed and divided between large hæmostatic forceps and the lobe removed. Such a procedure, however, is dangerous unless the recurrent laryngeal nerve can be plainly seen. I believe it better to split the capsule and by blunt dissection separate it from the anterior and upper surface of the lobe thus exposing the superior vessels which can easily be ligated and divided between two ligatures. Before these vessels are reached, sharp bleeding may occur from some large accessory veins and those may be mistaken for the main vessels. The upper lobe is then lifted with the index finger and middle finger and the stripping of the capsule continued, when suddenly it will be noted that the capsule becomes thicker and a distinct plane of cleavage encountered. The thinned thyroid gland adherent to its capsule has been lifted from the adenoma. Enucleation can now be rapidly done though much oozing may be experienced which may be greatly lessened by grasping the firmer adhesions or attachments of the adenoma to the gland proper with hæmostats before division, and by packing the cavity left with a little gauze. After sweeping around the lower pole the mass may be dislocated, its attachment to the isthmus grasped and crushed and divided. This leaves a cavity the bottom of which contains portions of the normal gland and the posterior capsule. As much of the atrophied thyroid may be now removed by resection as desired; it is probably wise to remove the lower pole in all cases after exposing and ligating the inferior thyroid vessels. Removal of the gauze packing and ligation of the points grasped by the hæmostatic forceps will show a dry field not requiring drainage, as a rule. It is well to swab the wound with Harington's fluid or tincture of iodine, especially the region of the

stump of the isthmus. The divided muscles are sewed with catgut, the split deep fascia and muscles with the same material and the flaps brought down and sutured with horse-hair, silk or two subcuticular silkworm gut sutures. If drainage is used it should be in the form of a very small Mikulicz tube, or a strip of rubber and should be brought out of a separate stab opening in the middle of the flap near its lower border. The drainage is removed in 36-48 hours and not replaced.

PERICOLIC INFLAMMATION

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AN apology for the title of this paper is necessary. The title of itself means nothing and hardly conveys a correct idea of the subject I really wish to discuss. I have used it for convenience and according to custom. Of recent years several cases of pericolic, sigmoiditis, and perisigmoiditis are recorded, and a few papers on the subject may be found in the literature. In many of the recorded cases no mention is made of the etiology of the inflammation, but an abscess situated in the left of the abdomen or anywhere near the colon is described as a case of pericolic. Although our knowledge on the subject is still somewhat scanty yet we can say something, and attempt to give some classification.

Definition.—The condition under discussion is one in which there is an inflammation of the walls of the colon, and often surrounding tissues. This may terminate as any other inflammation in *resolution, suppuration, ulceration or gangrene* leading to perforation of the intestinal wall with either diffuse or local peritonitis. The inflammation may also result in the formation of a chronic swelling of the colon and possibly the surrounding tissues, which clinically and macroscopically resembles a carcinoma and can only be differentiated from the latter by microscopy. The condition is not one of ulcerative colitis, although it may be secondary to it. Inflammation around the colon occurs in appendicitis, in inflammatory affections of the uterine appendages, in some bone lesions, in gastric and other visceral affections, and possibly as suppurating hæmatomata. All such abscesses should not be described as pericolic, they have no right to the title. I reject obscure cases of abdominal suppuration, whether incised by the surgeon or rupturing into the bowel, or seen in the *post-mortem* room, unless the infection can definitely be traced to the colon.

By the word "pericolic" I imply not simply around the colon but having an origin in the colon, otherwise the word means nothing, and nearly every case of intra-abdominal suppuration may fall in this category.

Account must always be borne in mind of the many and various positions of an appendicular abscess, and also of those rare cases of transposition of viscera where an appendiceal abscess will occupy the left half of the abdomen.

Classification.—In attempting a classification according to etiology we are at once confronted with difficulties. These arise partly from insufficient post-mortem records, and partly from an impossibility to determine the condition of the colon at operation, the patients fortunately recovering. I submit the following classification:

1. Inflammation in association with intestinal diverticula.
2. Inflammation in association with septic ulceration of the colon.
3. Acute, subacute or chronic inflammatory swellings of the colon, where in many cases the condition of the latter cannot be determined.
4. Inflammation in association with carcinoma of the colon.
5. Tuberculous inflammatory swellings of the colon.

1. *Diverticula of the Colon.*—Diverticula of the intestine are divided into congenital and acquired formations. The most perfect and at the same time the most obviously certain congenital diverticulum is that first described by Meckel. The important part this diverticulum plays in the etiology of acute intestinal obstruction is well known. Also of recent years acute or chronic inflammation in and around this diverticulum has been much discussed. This diverticulum probably always is implanted into the small intestine at a more or less constant position. In addition to this congenital diverticulum the small intestine at times is seen to possess other pouches. For instance an accessory pancreas or tumor may, by traction, so drag on the walls at the site of attachment as to produce a distinct diverticulum. Also diverticula have been observed between the layers of the mesentery of the small intestine. These latter are probably examples of acquired diver-

ticula and are of the *false* variety. It is customary to divide diverticula into the *true* and the *false*. The true diverticulum contains all the coats of the intestine in its wall, whereas the false lacks the muscular coat, in whole or in part, and is regarded as a hernial protrusion of mucous membrane. Apart from Meckel's diverticulum and those diverticula produced by tumors, the pouches of the small intestine have little clinical significance. Gordinier and Sampson, however, record one case where inflammatory adhesions around these diverticula between the layers of the mesentery kinked the transverse colon and produced intestinal obstruction.

Of recent years it has been repeatedly shown that diverticula of the large intestine have a very important bearing on some inflammatory affections of the colon. These diverticula of the large intestine are generally regarded as acquired formations. They are most frequently multiple and may be found at any part of the circumference of the bowel, or even into the appendices epiploicæ. As regards their frequency I quote the following figures from Georgi, and Gordinier and Sampson.

In 8133 autopsies at the City Hospital of Dresden an acquired diverticulum was found 8 times in the large intestine.

In 2600 autopsies at the Johns Hopkins Hospital acquired diverticula were found 19 times in the large intestine.

In 953 autopsies at the Bender Hygienic Laboratory a diverticulum was found twice in the large intestine.

In 2382 autopsies at the Boston City Hospital a diverticulum was found only once in the large intestine.

Graser and Sudsuki who specially looked for these diverticula were more successful in their search. The former found them in 10 out of 28 cases and the latter confining his attention to the sigmoid colon demonstrated their presence in that loop of bowel in 15 out of 40 cases.

Personally I have for some months past been examining colons and have found diverticula present on only 2 occasions. In both cases the diverticula were multiple and were found in the whole of the large intestine from the cæcum to the lower end of the pelvic colon.

The diverticula in both cases were into the bases of the appendices epiploicæ, most numerous in the pelvic colon, about $\frac{1}{2}$ in.

long on an average and had the fatty appendix attached to the summit. Their walls were formed towards their bases of all the intestinal coats, but as their distal extremities were reached the muscular coat was absent. This was so in several of the appendices which were examined.

The figures which I have just quoted vary considerably. This may probably be because pathologists not being interested have not made an exhaustive search. It is significant that when specially looked for the diverticula have been found more frequently, although I confess I have not found them with anything like the frequency with which Graser and Sudsuki did.

The etiology of these diverticula is not definitely settled. Most observers have regarded them as *acquired* and there is no doubt that generally the diverticulum is of the *false* variety. In the two specimens that I have seen the whole colon was involved and the pouch in every case was into the base of an appendix epiploica. I can hardly conceive that such a regularity in their situation could have occurred if they had been produced during the patient's lifetime by any muscular weakness of the wall of the bowel. The clinical history of one was unknown; the man died suddenly of cerebral hemorrhage. In the other death occurred from heart disease, without any abdominal symptoms. In neither case was there any reason to think that the vessels of the bowel had anything to do with the production of these diverticula. I am inclined to regard these pouches as congenital in origin. As regards the etiology of the acquired diverticula of the colon the following points may be considered: they have been found almost always in the intestines of middle aged or elderly people; in obese persons and in thin ones; and at times in those the subject of a general mesenteric venous stasis. Distention of the intestine has been performed by several observers with the idea of determining the weak spot in the bowel wall. Very often this was found to be at the mesenteric attachment, and diverticula were produced *post-mortem* similar to those occurring during life. But the conditions in artificial distention of dead gut and normal or pathological distention of living gut are hardly identical, and therefore these experiments do not stand as of much value. One's experience is that distended living gut yields generally along the

antimesenteric border, first through the serosa, and then by a giving away of the musculature. The distention to which dead bowel must be submitted before it ruptures is very considerable and probably out of proportion to that which ever occurs during life. Again, in the cases in which these diverticula have been found there has not been during life any such cause for distention: obstruction has been absent.

Graser considered that venous congestion plays an important rôle in the production of these diverticula. The dilated veins he thought would cause a point of weakened resistance in the muscular wall of the bowel, some intra-intestinal pressure therefore might be sufficient to commence a hernial protrusion at the area so weakened. The diverticula would then follow the paths of the venous sheaths, which they are often found to do. It would seem that this would only explain the origin of these diverticula occurring at one aspect of the intestine, but Graser would think that it would apply to all diverticula even to those at the antimesenteric attachment. Personally I cannot conceive that this method of production can have any influence save at that site of the bowel where the large veins leave. I cannot think, therefore, that this will explain the origin of those diverticula into the appendices epiploicæ, or of those diverticula at some distance from the mesenteric attachment. The weightiest argument against this idea is perhaps that in many, and probably in the majority of cases, no such venous stasis exists. It is seen that the results of an experimental distention of the bowel have not added much to our knowledge of the origin of these diverticula. As they have been found in obese and thin bodies, in those dying of wasting diseases, in those bodies where congestion of abdominal viscera is present, and in those in apparently perfect health, and as they occur at any point on the circumference of the gut, the various views so far put forward do not admit of any satisfactory explanation applicable to every case. It seems only right to conclude that all these diverticula have one common origin. As has been mentioned above they are found in middle aged or elderly persons, very often in those who have been habitually constipated, judging from clinical records.

Beer considers that this points to muscular deficiency, and in

the muscular weakness he thinks the cause of the formation of false diverticula must be sought. This idea will explain those diverticula which arise both at the mesenteric and antimesenteric borders of the bowel. A localized weakness of the bowel wall would cause the latter to give way before some internal pressure, the weak muscular bundles would in time become separated, and the protrusion would therefore be formed of mucosa. This view also explains how in some cases muscular fibres cover in part the wall of these diverticula.

However produced these diverticula are of great pathological interest and many are the accidents which may befall to persons possessed of them. Judging from post-mortem records they would appear to be more commonly harmless than giving rise to symptoms so far as can be seen from present clinical observations.

These diverticula may give rise to the following pathological conditions:

a. Diverticula Producing Vesico-intestinal Fistula.—So long ago as 1858 Sidney Jones reported a case of a man who passed feces and gas in his urine. At post-mortem examination a communication between the bladder and a perforated sigmoid diverticulum was found. Hepner records the case of an aged woman who had signs of abdominal suppuration. A spontaneous opening occurred into the bladder. The operation showed a communication between the bladder and an abscess developed around a diverticulum of the colon. Heine reported the case of a woman 59 years of age who suffered from a vesico-intestinal fistula. Laparotomy showed that the sigmoid flexure was adherent to the bladder by a false diverticulum. The openings in the viscera were successfully closed. Heine collected 7 similar cases from the literature: in only one case was the diverticulum single. The true diagnosis can only be made at operation or postmortem. In 3 of these cases laparotomy was performed, and in 2 of these with success; in one however the fistula recurred, and colostomy was done. The radical treatment of such cases consists in suturing both the openings. Palliative measures are colostomy and entero-anastomosis. It may be pointed out here that the majority of vesico-intestinal fistulae are inflammatory in origin.

b. Diverticula Leading to Diffuse Peritonitis.—Georgi men-

tions three examples of this. Mertens records the case of a man 45 years of age who died from general peritonitis as the result of a perforation of a diverticulum. Warnecke reports the case of a man 40 years of age who, after a slight abdominal contusion, developed diffuse peritonitis. The cause of this as revealed at operation was a perforation of a diverticulum. Brewer mentions the case of a man, aged 54 years, who had been ill for 4 days and on his admission to the hospital showed signs of diffuse peritonitis. The abdomen was opened and the peritoneal cavity contained a quantity of thin, foul-smelling pus. At the bottom of the pelvis was an oval concretion lying near to the gangrenous remains of a small perforated diverticulum.

c. Diverticula Leading to Localized Suppuration.—The abscess has, I think, been invariably found in connection with the descending, iliac or pelvic colons. It may be intra- or extraperitoneal. The following is a brief note of a case of a localized intraperitoneal abscess under my care:

CASE.—Male, age 55 years. For some years he has suffered from constipation. For about ten months he had experienced some pain in the left side of the abdomen. The pain had not been acute nor constant, but he was frequently conscious of something wrong and attributed it to his constipation. For four days the pain had been much more acute, rendering him unfit for work and he had taken to his bed. He had not vomited but had constant nausea. The bowels were very constipated. His temperature was 101° and pulse 110. The abdomen was not distended; on the left side was a fairly well-defined swelling, which occupied the left iliac fossa, reaching upward to the costal arch and in to the mid-line. This was tender but not excessively so. During the following three days the temperature varied from 99.6° to 101.8° , and the pulse from 100 to 110. The swelling remained about the same. The bowels were very constipated and copious enemata only succeeded in bringing away small scybulous masses. The diagnosis made was carcinoma of the colon with localized suppuration. Operation was performed on the seventh day of the acute illness. The swelling was an intraperitoneal abscess. After drying the abscess cavity some fecal matter was seen at the bottom of the wound, and this was found to issue from a diverticulum in the colon; the diverticu-

lum was pulled away as a slough. For a few days some fecal material came from the wound; the latter closed in about six weeks. The induration gradually subsided and in six months' time there was no more than could be accounted for by scar tissue only. The man was then quite well save for constipation.

Georgi and Rolleston record similar cases. Rolleston also records the case of a retroperitoneal pericolic abscess. The autopsy in the case of a woman, 47 years of age, revealed a large retroperitoneal abscess on the left side extending from the brim of the pelvis to the diaphragm, containing pus and clay-colored feces. The descending colon showed towards its lower end three deeply excavated ulcers, two of which opened into the abscess cavity, one of the latter was at the tip of an acquired diverticulum. Koch records a case of a man, 64 years of age, who had signs of intestinal stenosis. Colostomy was performed. At the postmortem abscesses originating from diverticula were found in the wall of the intestine.

It is very probable that other cases of suppuration around, and having origin from the colon may be due to inflammatory changes around one or more of these diverticula. Brewer is inclined to this view, and one of his cases in which he found an oblong fecal concretion in the abscess cavity lends support to the theory. Moynihan had little doubt that in one of his cases the abscess arose from a perforation of a false diverticulum of the colon.

d. Diverticula Leading to Chronic Inflammatory Changes in and Around the Colon with the Formation of a Tumor, Closely Simulating Carcinoma.—Moynihan records a case in which he excised a tumor of the ileopelvic colon thinking it was malignant. The tumor was found to be merely inflammatory, having its origin in and around multiple diverticula of the bowel. Mayo reports five cases where an extensive resection of the descending and ileopelvic colons had been done, and the examination of the removed specimens showed them to be inflammatory changes produced by numerous diverticula of the bowel.

e. Diverticulitis Produced by Foreign Bodies.—Bland-Sutton records two very interesting examples of this. The first case was a man 40 years of age, who had suffered from acute pain in the left iliac region, accompanied by some local swelling, tenderness and fever. The swelling was an enlarged and inflamed epiploic appen-

dix of the descending colon. On splitting the appendix longitudinally there was a cavity communicating with the colon by a narrow passage. Inspissated fecal material filled the cavity and in the midst of this was a sharp foreign body. The second case was a woman 60 years of age, who suffered from intestinal obstruction, associated with a definite lump in the left iliac fossa. This was thought to be a cancer of the colon. The lump, however, caused more pain than is usual with cancer and was particularly tender. At the operation the mass was found to be in the sigmoid flexure and was thought to be malignant. A wide excision was performed. On bisecting the resected portion there was found a round pill-like body lodged in a smooth-walled cavity communicating with the mucous surface of the bowel by a narrow tubular channel. The globular body in the cavity had a fragment of straw as a nucleus. The course of events Bland-Sutton described as follows: The piece of straw ingested with food had perforated the colon in the immediate vicinity of an epiploic appendix and had caused a small leakage of bowel-contents. The extravasation of fecal matter into the epiploic appendage infected it and set up inflammatory changes which transformed this fatty fringe into an oval lump.

Since this paper was written a very fine and interesting account of these diverticula of the colon has appeared in the *Lancet*, 1908, March.

2. *Ulceration of the Colon.*—Dysenteric, tuberculous and even typhoidal ulcers may perforate the colon. Such cases have their disease labelled before the acute catastrophe occurs. The simple or so-called stercoral ulcers and other acute or chronic ulcerative conditions may cause peritonitis.

The following are the brief notes of a case under my care where diffuse peritonitis was caused by ulceration of the colon: Male, aged 52 years. No previous history of any importance. His illness commenced suddenly with abdominal pain and sickness. Shortly after the onset of the pain, diarrhoea set in and on several occasions some black blood was passed in the stools. This blood ceased after the first 48 hours. The pain was felt in the left lumbar and iliac regions, and here there was distinct tenderness. At the onset the temperature was subnormal and the pulse 84. During the next few days the pain and tenderness persisted with a tem-

perature varying from 99°–100° and a pulse of 80–90. Diarrhoea continued. The abdomen became a little distended. Operation was performed on the eighth day of the illness. The peritonitis was limited to the lower and left part of the abdomen: the intestines were covered with lymph and some serous exudate was seen in the descending and iliac colons, but no perforation was discovered. The peritonitis progressed and death occurred.

Postmortem.—The only lesions were those of the colon and diffuse peritonitis. The descending and iliac colons showed several acute ulcers with their floors formed only by peritoneum, and in one, the floor was so thin that it gave way on manipulation. The colon below this ulcerated portion showed the follicles acutely inflamed.

This case seems to be an example of acute ulcerative colitis with secondary peritonitis. Localized suppuration also may occur from an ulcer of the colon.

3. In perhaps the greater number of cases of pericolitis the exact cause is not found. This may be because the inflammatory swelling subsides under medicinal measures; or if suppuration occur the abscess after incision and drainage heals, and the operation although establishing in all probability the fact that the abscess arose from the colon, the method of origin could not be determined. Or again masses in connection with the colon, exposed at operation, and thought to be malignant after colostomy or a short circuiting operation have been known to disappear entirely, and the patients have remained in perfect health for some time afterwards. It is obvious that such pseudoneoplasms are of inflammatory nature. The frequency of diverticula of the colon is becoming more and more recognized and as time goes on it will probably be shown that more and more of these cases will be proved to be examples of diverticulitis. Still in the present state of our knowledge it is hardly fair to assume this, and the most that can at present be said is that there is a class of cases of pericolitis in which the etiology is not accurately determined. Three varieties may be distinguished: *the simple or non-suppurative acute, or subacute, localized inflammatory mass of the colon; the suppurative pericolicitis, and the chronic inflammatory pseudoneoplasm.*

a. The Acute or Subacute Localized Inflammatory Mass of the Colon.—The following case seen recently is an example:

Female Aged 27 Years.—She had always been more or less delicate. She had a quiescent cavity in the lung. She had often been constipated, although I could not gather that immediately preceding this illness constipation was more marked than usual. The present illness was said to commence with pain in the left iliac region, and diarrhœa, both of which symptoms were trivial at first and were endured for two weeks before seeking relief. She was kept in bed and on light diet, and shortly afterwards a swelling was noted in the left iliac fossa; this region had been tender throughout. An examination of the stools showed that they were very loose, contained at times a little mucus, but never any blood, they were small in size and only a comparatively small quantity of feces was evacuated. The swelling in the left iliac fossa was cylindrical and about 2 inches in length, smooth on the surface, lying obliquely, movable somewhat from side to side, and in the exact line of the colon: it was definitely tender. P. R. nil. At times a little fever was recorded, 99° – 99.8° . The appetite failed a little and the patient generally was languid and easily tired. Mild aperients were administered and enemata which, although very successful in producing complete evacuation of the bowels, caused no appreciable diminution in the size of the swelling. It was clear therefore that fecal impaction could be excluded. The treatment was a low diet, mild purgation, with an occasional enema and in two weeks the swelling disappeared, and the patient was perfectly restored to health.

This case was, in all probability, a localized inflammatory swelling of the pelvic or iliac colon, probably without any pericolic inflammatory adhesions. It was evidently caused by constipation. The probability is that some catarrh of the colon was set up by the retained feces, with or without ulceration, and a slowly produced and slight bacterial infection of the walls of the bowel resulted. Removal of the cause cured the patient and led to a disappearance of the inflammatory thickening.

Many similar cases are recorded. Mather records a case of a lady of 78 years of age, who suffered from diffuse colicky and burning pains, which after two days located themselves in the lower

left quadrant of the abdomen. Some vomiting was present. For some years she had been constipated and had had occasional attacks of diarrhoea. In the left quadrant of the abdomen a tender, broad, elongated, smooth, resistant sausage-shaped tumor was noticed. Some elevation of temperature, 100° – 100.5° , was recorded. The tumor persisted for about a week and gradually subsided and disappeared with diminution and entire cessation of pain. Walker records a case of a woman, aged 55 years, who complained of lassitude and constipation. As a rule the bowels were regular, but for some six weeks had been opened only at intervals of 3 or 4 days, and this with some difficulty after the administration of purgatives and enemata. She then developed pain and a brawny indurated swelling in the left iliac region. The tongue was furred; the temperature 103° , and pulse 120. The constipation was treated; and a low diet ordered and locally fomentations were applied. Within a week some relief was obtained, and the temperature began to fall. Two or three weeks later the swelling subsided, but 4 or 5 weeks passed before the temperature became normal and the tongue perfectly clean. On more than one occasion mucus was passed but never any blood. Sieur reports a case of a man 50 years of age, who suffered from pain in the left iliac region. This pain had been coming on by degrees, and the exact time of onset could not be fixed, but latterly had taken such acute characters that he sought advice. He was not strictly speaking constipated; the passage of stools and gas was always followed by a diminution of the pain. His appetite was impaired and his general health was failing. At times there was a little blood in the stools. An examination of the abdomen was difficult on account of the pain provoked by pressure. All the tenderness was limited to the course of the large intestine, and a sort of induration was felt there. P. R. nil. All these symptoms disappeared, and two years later the man was in perfect health. Sieur records a second case of a man, aged 35 years, who had suffered frequently from colic and constipation. Abruptly his bowels became confined for six days and the abdomen became swollen. The pulse was regular, his face pale and a little drawn; there was no nausea. Enemata opened his bowels. In the course of the iliac colon was a tumefaction the size of a large orange and tender to pressure. Blood was passed in the stools. The treatment

was absolute rest and enemata of oil. P. R. nil. Little by little the bowels regulated themselves, became normal in composition, and the induration gradually diminished in size and became less sensitive. At the end of two months the intestinal functions became normal yet some sensitiveness persisted over the left colon.

The above cases are cited as examples. The precise intestinal lesion cannot be determined in such cases, but presumably there is an inflammatory thickening of the walls of the colon due to some lesion of mucous membrane excited originally by constipation, or possibly a diverticulum may be present. The cases that are recorded show that the lesion is in all instances confined to the iliopelvic colon, that is, at a part of the colon very variable in length and position where feces may accumulate. This loop of the pelvic colon according to Cantlie is narrowed at both its extremities, and therefore predisposes to the retention of feces.

The essential features of this condition are as follows: The patient is a man or woman of any age. It is recorded at the ages of 7, 11 and 12 years, but generally the patients are of middle age. Capasso thinks that young adult male subjects are most frequently affected. The disease may begin insidiously with transitory pains in the left iliac fossa, the motions being irregularly voided, and possibly containing mucus and blood. As the disease progresses a tumefaction becomes obvious in the left iliac fossa. Elevation of temperature may or may not be present: at times high fever is recorded. Diarrhoea may be complained of, but in such cases very little fecal material is voided. The general health may suffer, the tongue becomes coated, nausea, even vomiting, and loss of appetite are common symptoms. The tumefaction palpable in the left lower abdomen is cylindrical, smooth, tender, perhaps movable laterally and definitely in the course of the colon. Enemata resulting in a good action of the bowels, produce no immediate reduction in the size of the swelling and thus fecal impaction is excluded.

The progress of this condition varies with the severity of the attack. In mild cases under appropriate treatment the patient rapidly improves, in the more severe forms many weeks may elapse before perfect health is restored. Suppuration may occur.

The treatment consists in the administration of mild aperients

and enemata; local applications may ease the pain. The diet must be carefully chosen. After acute symptoms have subsided great care must be exercised in the regulation of the bowels to ensure against a relapse.

b. Suppurative Pericolitis.—By this is understood a suppuration around the colon and arising from that portion of the bowel, the condition of the latter not being determined. The following case is an example:

Female, aged 52 years. She had suffered from constipation for some years and also occasional attacks of pain in the left iliac region of the abdomen. These pains were worse when constipation was most troublesome, but were never sufficiently acute to make her lie up. She was suddenly seized with acute abdominal pain and vomiting, both symptoms appearing after eating some winkles, and were directly attributed to the fish. The pains of onset were more or less general throughout the abdomen with special severity in the lower part; they were griping in character. Diarrhœa was a prominent symptom the first week of the illness and the motions were often streaked with blood and contained mucus. At the end of a week the colicky pains subsided, but a fixed pain persisted in the left iliac region. Constipation became obstinate. Some fever was said to have been present throughout.

On admission the temperature was 102°, the pulse 108. The abdomen was normal save in the left iliac and hypogastric regions and here a very well-defined swelling was palpable.

An incision was made over the most prominent part of the swelling and about 12 ounces of foul pus evacuated. The pus contained *Bacillus coli* and streptococci. The abscess cavity was walled off by small intestine and omentum: in the floor and to the inner side was the colon. The latter was severely inflamed and thickly coated with lymph. No gas was present in the abscess. A search was made for a diverticulum but none could be found. No thickening suggestive of neoplasm could be felt. For two days after operation everything went well, then obstructive symptoms set in and ended acutely on the fourth day. The cæcum and transverse colon were seen greatly distended and, assuming the abscess was the site of obstruction, a transverse colostomy was performed through a median incision. Death occurred shortly afterwards, apparently from

acute toxæmia. In this case it seems clear that the abscess was from the colon, both from the history of the illness and the findings at operation. The lesion of the colon was undetermined. Some ulcerative condition is suggested from the passage of blood and mucus in the stool at the beginning of the illness.

Several cases of a somewhat similar nature are reported in medical literature. In such cases the suppuration is around the colon, most frequently on the left side of the abdomen in connection with the descending iliac or pelvic colons. Bowel symptoms, *e.g.*, diarrhoea, the passages of blood and mucus, or obstinate constipation may have been present. Operation has resulted in the cure of the abscess, and hence the lesion of the colon has remained undetermined. The clinical history of such cases is that of an acute peritoneal inflammatory lesion with localizing signs in the region of the iliac or pelvic colon. Symptoms of abscess follow. In fact the clinical course is similar to that of suppurative appendicitis with the localizing signs on the opposite side of the abdomen.

c. The Chronic Inflammatory Pseudoneoplasms.—Cases are recorded in which the colon has been excised on the supposition that the swelling which it contained was a new growth. The most careful examination of the specimen has failed to reveal anything but inflammatory changes in and around the wall of the bowel. Moynihan records a case where a part of the transverse colon was removed and a most careful examination failed to reveal any sign of malignancy, neither was a diverticulum present. The mass consisted of dense fibrous tissue; the mucous membrane was normal. The origin of the inflammatory process could not be discovered. On several occasions has the intestine been short-circuited for a supposed malignant growth of the colon, and following the operation symptoms have subsided and the swelling has entirely disappeared. These cases remind us very forcibly of those inflammatory masses of the pylorus, which disappear after gastro-enterostomy.

Moynihan records such a case in a woman aged 62 years, in whom the tumor was situated at the splenic flexure and was densely adherent to the abdominal wall, diaphragm, stomach, and small intestine. Ileosigmoidostomy was performed. The tumor entirely disappeared. Robson mentions that he has performed a colotomy on five occasions for persons supposed to be suffering from cancer

of the sigmoid colon or rectum. In all cases the tumors entirely disappeared. Robson also records cases in which he has performed a short-circuiting operation for adherent masses of the colon, which, as a direct result of the operation have entirely disappeared. In the following case under my care a similar result occurred: Male, age 56 years. He had suffered from constipation for some years and for the past few months this had been getting worse, the bowels only acting every three or four days and then only after strong aperients. He had complained for some time of pain in the left abdomen. The abdomen became swollen, varying according to the constipation. A large irregular mass was felt in the left side of the abdomen and iliac fossa. This was considered to be carcinoma of the bowel. At the operation it was found adherent to the abdominal wall and had infiltrated extensively the omentum. It was irremovable and so the ileum was anastomosed to the pelvic colon below the mass. In six months' time the tumor had entirely disappeared and the man was reported as quite well. The origin of these chronic inflammatory masses which disappear after operation it is impossible to explain. They may have been due directly to some diverticula of the colon. But that they need not always have this origin is proved by the case of Moynihan where there was no diverticulum nor any lesion of the mucous membrane. Possibly some cases are examples of hypertrophic tuberculosis of the colon to which further reference will be made. It seems generally impossible to differentiate these inflammatory masses from carcinoma by naked eye examination only, and this is to be regretted seeing the good results obtained by intestinal anastomosis, a procedure probably attended with less risk than that of excision.

4. *Pericolitis Associated with Carcinoma of the Bowels.*—Inflammation consecutive to carcinoma is by no means uncommon. In 54 cases I have observed suppuration in no less than 13. In 2 cases the peritonitis was diffuse and in 11 cases there was a localized abscess. In 4 cases of localized suppuration the primary growth was in the cæcum: in 1 case at the splenic flexure or descending colon: in the remainder (6 cases) in the iliopelvic colon. The inflammation may arise by direct continuity from the growth or a stercoral ulcer above the cancer. The suppuration in these cases is not usually attended with acute symptoms. Perhaps the patient

dates the illness from the onset of the suppuration, but a little questioning shows that this is not so. In the majority of cases some previous symptoms of obstruction can be obtained. Such symptoms are colicky pains, flatulence, increasing difficulty in getting the bowels opened, at times abdominal distention relieved by the passage of flatus, the pain and flatulence being often worse after food. It must be remembered that a carcinoma in the cæcal region often does not give rise to obstruction, the constriction here must be very tight to prevent the passage of the fluid bowel-contents. When suppuration occurs the symptoms are quite subacute. Pain more or less localized to one area of the colon, tenderness at this spot, and perhaps some abdominal rigidity are the earliest signs. A little fever is perhaps present at the commencement, but this is generally only slight. Should a swelling have been felt previously it will become increased in size and more indefinite in outline. The probability is that no tumor will have previously been felt. The patient may never have been seen before, or should he have been, a tumor may not have been detected. In the cæcal region in all probability the tumor could have been felt as this portion of bowel is comparatively superficial, but, if occurring in the iliopelvic colon, the chances are that the tumor will lie too deep for palpation. Fixation of a previously mobile tumor, if occurring with an increase of local pain and perhaps a little fever, suggests inflammation. At times, however, some fever is seen in uncomplicated cases of cancer of the colon. The latter is seen in the large ulcerating growths and in this type, when pericolitis occurs, the infection arises usually from the base of the ulcer. In the small contracting growths, fever is usually absent in uncomplicated cases, and when pericolitis occurs it arises from a perforation of an ulcer above the growth. Should suppuration occur around a cæcal growth appendicitis or ilio-cæcal tuberculosis will have to be differentiated: and when occurring in connection with the iliopelvic colon simple sigmoiditis or perisigmoiditis, diverticulitis and tuberculosis of the colon will have to be considered.

5. *Tuberculosis of the Colon*.—It is now a well established fact that there is a localized inflammation of the colon produced by the tubercle bacillus. This is seen most frequently in the ilio-cæcal region—the ileo-cæcal tuberculosis. But other parts of the large in-

testine are at times also similarly affected. Ileocaecal tuberculosis is a well-recognized form of intestinal infection, but perhaps it is not so well known that other segments of the colon are occasionally involved. The most frequent is the ileopelvic colon. It has also been seen in the ascending colon, hepatic flexure and transverse colon. The lesion may be *ulcerative* or *hypertrophic*. The latter is perhaps the more frequent variety in the colon, and it is of particular interest inasmuch as it forms a distinct tumor which may be mistaken for other forms of chronic inflammatory swelling or more likely for carcinoma. It is a localized abdominal tuberculosis without infection of the general peritoneal cavity, although the neighboring lymphatic glands may be, and often are, similarly affected. The disease is often secondary to some apparently quiescent focus in the lungs or throat. It would seem that the tubercle bacilli ingested, in a state of low virulence, would produce their results in a portion of the intestinal tract where stagnation of feces is liable to occur, in a person of great resistance. The result would be a very chronic inflammatory swelling, without perhaps any ulcerative lesion of the mucosa of the walls of the bowel. It is probable that the bacilli may gain entrance to the wall of the bowel without there being of necessity any lesion of the mucosa. The resulting lesion may be more intense in the submucosa or subperitoneal portions of the intestinal wall. Estes records a case of a swelling of the sigmoid loop of bowel in which tubercle bacilli were found, the swelling being in great part composed of a hyperplasia of the muscular elements of the bowel-wall.

In cases of tuberculosis of the colon definite tubercles may or may not be seen on the peritoneal surface of the intestine. In the hypertrophic variety they are usually absent. The proof that the tubercle bacillus is the cause of the inflammation in these cases is given as follows: The organism may be found in great numbers; in some cases caseation is seen; in some cases caseation is present in parts of the tumor, whereas chronic inflammatory hyperplasia is present in others; at times giant-cells are seen; inoculation may be positive. In the majority of cases there is a quiescent focus of disease in the lungs or throat. The microscopic examination will show that the disease is neither cancer nor sarcoma. It may at times be recognized by an experienced naked eye. The gut is much dimin-

ished in lumen so that at one, or perhaps, at more than one place a definite stricture is present. Ulceration may or may not be present. In the subserous variety ulceration is absent and this distinguishes it from carcinoma. In the submucous variety ulceration is trivial as compared to the submucous infiltration. The ulceration when present does not show the thickened edges of a carcinoma. The thickening has a bluish or whitish-gray transparent appearance, and is of cartilaginous hardness. The muscular coat is also thickened by hyperplasia. Patches of caseation may be seen, but this is not usually found. Secondary pyogenic infection may occur.

The subjects are generally middle-aged or beyond middle age. It is rare under 20 years of age. Kidd reports the case of a child of 7 years of age. The symptoms are usually those of chronic intestinal obstruction. The disease has no definite symptomatology. Mucus and blood have been seen in the stools but only very rarely. This form of disease must be recognized as a distinct type. If not submitted to a careful microscopical examination it will probably be labelled carcinoma which, of course, should never be done in the case of any tumor unless proved to be so by microscopy. Tuberculous infection may be the real nature of some of the tumors of the colon which have been known to disappear after colostomy or short-circuiting the loop of bowel which bears the tumor. The diagnosis of this condition is hardly possible. A chronic swelling of the colon, with or without pain and tenderness, producing some degree of obstruction, possibly with remission of symptoms, occurring in a person who has been known to have had tuberculosis, may be viewed with suspicion. The symptoms are gradual and fever may or may not be present. Even in such a case it cannot be said that the disease is not carcinoma or some non-tuberculous inflammatory swelling.

Summarizing the above it is seen that there are several varieties of pericolic inflammation, the etiology of some of which is definitely known, whilst in some the etiology is still obscure. The differential diagnosis of the several varieties is in the majority of cases practically impossible, and hence the word *pericolitis*, to include the several varieties, may be retained from the clinical standpoint. On the pathological side the word has no significance.

Where the pathological diagnosis can be made (this is generally only possible at operation or postmortem) the correct name, *e.g.*, *diverticulitis*, *tuberculosis*, etc., is given to the disease. This unfortunately is not always possible, and in such cases all that can be said is that the case is one of *pericolitis*. In some cases there is little, if any, inflammation around the bowel, but it is the walls of the bowel only which are involved. It would be very confusing to use the word *colitis* for this condition as this is always used in reference to an inflammation practically confined to the mucous membrane. For distinction it is best to designate a local inflammatory swelling of the colon as *pericolitis*, unless the etiology can be determined. The etiology is the same as when the peritoneum around is involved. The latter is an extension of the former. The word *pericolitis* should be strictly reserved for inflammatory affections originating in the colon only. The words *sigmoiditis* and *perisigmoiditis* have not been used for two reasons. The sigmoid colon is by anatomists now differentiated into the iliac and pelvic colons. If the words be still retained it only refers to a limited part of the colon and ignores the fact that the remainder of the colon may be similarly affected, although in the great majority of cases it is the ileopelvic colon which is involved in these inflammatory changes.

In cases of diffuse peritonitis, when searching for a cause, the colon should not be forgotten if no more frequently occurring lesion be found. The pelvic and iliac colons should be the first portions of the large bowel to be examined for a perforation of an ulcer or diverticulum. In cases of localized suppuration around the colon, when operating, the cause should be thoroughly searched for, and it may be possible to expose a diverticulum or demonstrate a carcinoma.

Diverticulitis may perhaps be suspected when one or more previously inflammatory attacks in the left side of the abdomen has occurred, and has resolved. Such, however, is not the usual history of cases of diverticulitis. It was suspected for this reason in one recorded case and operation proved the correctness of the suspicion. In non-suppurative diverticulitis the mimicry of carcinoma is complete. Tuberculosis of the colon may possibly be suspected when symptoms of intestinal obstruction occur in asso-

ciation with a tumor of the colon, in a person who has previously been known to have tuberculosis. This, however, is very little evidence upon which to rely.

A carcinoma of the colon, when associated with suppuration, may, perhaps, generally be diagnosed. This may be done carefully noting the previous history and the slow and insidious onset of suppuration. It is practically impossible to differentiate a chronic inflammatory swelling, without suppuration, from a cancer.

In conclusion, it may be emphasized that there are many varieties of inflammation in connection with the colon, many of which mimic, more or less completely, cancer. The differential diagnosis is impossible in many cases. It is only by a clear appreciation of this fact that our diagnosis will, in the future, be made more certain. Diverticula are now well recognized as a not very infrequent cause of inflammatory trouble around the colon. Tuberculosis, although rare, does occur, and is responsible for some of the inflammatory swellings found around the colon. That pericolicitis is only a clinical diagnosis, and at operation every attempt should be made to arrive at the anatomical and pathological one. That the microscope is the only certain test of malignancy, and that in the colon, as elsewhere, no tumor should be called malignant unless proved to be so by this method. That inflammatory swellings of the colon are more frequent than is generally supposed, and the knowledge of this fact may, justifiably, support us in recommending an exploratory laparotomy, although clinically a complete removal of the mass seems out of the question. An anastomosis may, if the swelling be merely inflammatory, cure the patient.

Gynæcology

ON THE DISINFECTION OF THE UTERINE CAVITY IN PUERPERAL INFECTION

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A SPECIFIC, ideal treatment of puerperal infection by means of a suitable serum is yet to be discovered. Until more information is gained upon the subject, then, the treatment which has now been satisfactorily employed for some years past will have to be continued: disinfection of the uterine cavity. This disinfection or uterine cleansing, consists, on the one hand, in the removal of all organic débris, whether adherent or not, that has remained in the uterus; on the other, in the destruction by antiseptics of the microbes that have infected the mucous membrane.

All obstetricians are agreed as to the necessity and efficacy of this local treatment, but unfortunately they do not agree on the methods to be employed. Intra-uterine flushing, antiseptic dressings, drainage, scraping with the finger, brushing and curetting have all been recommended. The subject has been discussed on several occasions during the last few years in the French Obstetrical Societies, but it has not been possible for the partisans and adversaries of uterine curetting to come to an understanding.

To me it seems that in the local treatment of puerperal infection a prudent eclecticism is desirable: every method is good, provided it be applied on the right occasion, by an experienced physician, capable of a sound estimate of the clinical indications, and familiar with the technic of interventions on the puerperal uterus. No process should be applied to every case, to the exclusion of all others. But before proceeding farther there are a certain number of general principles that should be definitely understood.

1. It is indispensable before treating a uterus to be relatively certain that the infection has its origin in the uterus. The diagnosis should be made by exclusion, after examining the external parts, vagina, cervix, breasts, intestinal functions, etc.; in this way can be eliminated the action of wounds of the vulva or vagina, mammary infection, and stercoræmia, which frequently give rise to fever after childbirth.

To curette a healthy uterus when the trouble is really galactophoritis, or even intercurrent typhoid fever, would be manifestly to expose this intervention to an accusation of inefficacy that it does not deserve. Still, in doubtful cases of fever, occurring after childbirth in which it is possible to localize with surety the origin of the infection, a careful cleansing of the uterine cavity can do no harm.

2. It is indispensable that one should make a careful examination of the uterine cavity with the finger before proceeding to apply local treatment to the uterus. This exploration will inform one accurately as to the contents of the organ, as to the quantity and nature of the foreign substances it contains (pieces of placenta, membranes, or clots, organized or not), as well as to the degree of their adhesion and their position. From the data thus obtained will naturally be deduced the treatment to be followed.

This exploration is useful even when the operator has himself examined the placenta and has considered it entire; pieces of the caduca, an accessory cotyledon, fragments of thickened membranes may be retained without our being aware of the fact. This examination is harmless if it is done under strict aseptic precautions, after a careful toilette of the external genital organs when they are infected. Moreover the examination is always possible, as the cervix is permeable whenever the uterus is infected. With nervous women we have only to administer a little chloroform,—in which case the exploration can, if so desired, be a mere preliminary to the treatment itself. Finally, it is much better than exploratory instrumental curetting, as advised by some writers, for this demands great delicacy of touch on the part of the operator and may besides be dangerous.

In any case, to curette a puerperal uterus without know-

ing by previous intrauterine digital exploration the topography of its cavity, exposes the operator to the risk of making an incomplete and consequently useless intervention, since the curette may slip over an adherent cotyledon without removing it, or may not even come near it.

3. Cleansing of the uterus is particularly efficacious, and is followed by more rapid and certain recovery when it is performed soon after the symptoms set in, at a moment when the pathogenic bacteria are still localized in the superficial layers of the mucous membrane; it has less action or none at all, from the time that the infection has traversed the mucous membrane and has affected the uterine muscle, vessels, or neighboring organs.

In spite of this, however, it is necessary in every case, no matter of how long duration, to begin by removing all intra-uterine foreign substances capable of furnishing sustenance to the microörganisms. It should be noted that when an intervention of this nature is done at an early stage in puerperal fever, instrumental methods present a minimum of risk for the uterine wall, which has not yet been affected by the infection.

Entering now into the detail of the therapeutic indications, we may divide these cases of puerperal infection into two great classes: in one, the uterus contains organic *débris* liable to putrefy, free or adherent,—and this group is much the most common; in the other, the uterus is empty. As regards the treatment there is no necessity of separating infection following confinement from infection following miscarriage, though stress should be laid on the fact that in the latter instance retention of foreign substance is the rule, if it be no more than a fragment of thickened membrane.

I. THE UTERUS CONTAINS DÉBRIS.—Exploration made with one or two fingers has revealed the existence in the uterus of placental *débris*, more or less extensive, of membranes, clots, or hypertrophied *caduca*. There can be no hesitating, whether the symptoms be recent or of some duration: the uterus must be cleaned out as quickly as possible. This is an opinion unanimous among accoucheurs.

How should this be accomplished? I consider that the best way is to scrape the cavity with the finger, which process is in a way nothing more than a species of artificial delivery of portions

of the placenta. This consists in removing with one or more fingers, according to the dimensions of the uterine cavity, the retained and adherent débris. The finger, an intelligent instrument, understands accurately the nature and amount of débris to be removed, and the organ with which it comes in contact at every movement. The scraping should be performed with the edge and sometimes with the pulp of the finger, which makes it possible to remove everything adhering to the uterine wall, on condition that that organ be firmly held in place by the left hand pressing on the fundus through the abdominal wall. The latter manœuvre is essential to success, but requires in our opinion the administration of chloroform, in order to obtain complete relation of the abdominal wall; without anæsthesia this scraping is extremely difficult, because it is painful, and remains necessarily incomplete in the majority of cases. With the patient under chloroform it is possible to scrape the entire uterine cavity, including its corners, whatever may be the dimensions of the uterus. One finger should be used during the first two months of pregnancy, and two when pregnancy is farther advanced, —provided the other fingers are doubled up and introduced into the vagina. If the cervix is not sufficiently permeable it can be dilated extemporaneously by Hegar's method.

All these manœuvres, when carried out under anæsthesia, do no harm to the uterus, whatever may have been said to the contrary. The organic fragments that are detached can be removed either with the finger used as a hook or by abdominovaginal expression. This digital scraping can be done under the protection of an india-rubber glove, which presents the great advantage of guaranteeing the operator against infection. When the finger fails to detach some placental débris that adheres too closely, the material can be removed with the curette guided by the finger in the uterus. The extraction of retained fragments by means of the curette or other instruments, done blindly without previous digital exploration of the uterine cavity, appears to be an uncertain and dangerous operation that often remains incomplete for reasons already mentioned.

In post-abortion placental retention Bonnaire often uses, and always with success, a forceps of his own invention, whose two branches are introduced separately and then articulated in the same

way as those of an ordinary forceps. The use of this instrument with soft and blunted edges is harmless, unless great and unnecessary force be applied.

When nothing but membranes remain in the uterus, and particularly when they are more or less detached in its cavity, the use of the stiff brush is preferable for their removal. This instrument brings them out easily, as the membranes become wrapped about it like cobwebs on a broom.

The method of treatment that we have just described, consisting first in exploring and then in emptying, if necessary, the uterine cavity as soon, after a confinement, as signs of infection appear, is far preferable to the old method, in which one or more intra-uterine injections were resorted to before deciding on more energetic measures. Such injections are almost always inadequate when the retained *débris* is adherent. They do not prevent the infection from spreading to the deeper tissues, and valuable time may in this way be lost. On this account, therefore, when, a day or two later, more active intervention is determined upon, success may no longer be possible. On the other hand, such intra-uterine injections may suffice in two classes of cases when the fever is due to retention of free decomposing clots, or when the retention is due to ante flexion of the uterus preventing free drainage; the injections then act mechanically.

In private practice physicians are far too much inclined to try to treat all initial puerperal infection by means of timid intra-uterine injections; they have not the courage to propose from the start a more energetic course of action, and that for a variety of reasons. They beat about the bush, and are too often content with washing out not the uterine cavity but the vaginal *culs-de-sac*, or, in some instances, the cervix or lower segment of the uterus. For it should be known that an intra-uterine injection is neither always easy nor inoffensive.

Consequently, and we repeat, it is necessary before doing anything else to explore the uterine cavity with the finger, and then to clean it out if it contains any foreign bodies. The point next arises whether when this has been properly done it is desirable to perform any complementary operation, such as brushing or curetting.

Several authorities of the present day are afraid of instrumental interventions.

We think that from this point of view two categories of cases must be considered: those in which the infection is of recent date, and those in which it is of long standing.

a. When the infection is of recent date, not more than a few days, when the fever is not very high and is not yet accompanied by rigors denoting general infection, when, in a word, we have reason to believe that the pathogenic bacteria have not yet spread beyond the superficial layers of the *caduca*, it is advisable to complete the digital scraping systematically either by brushing or curetting, so as to remove not only the *débris* which the finger may have left behind, but the entire uterine *caduca* capable of being infected. The curette is preferable in post-abortive infection, the uterine wall being thick and not much exposed to perforation. The curette also removes better than the brush the adherent and hypertrophied *caduca*.

The brush and curette have been accused of many misdeeds, among others of uterine perforation, serious hæmorrhage, and generalization of the infection through opening of vessels. There is no doubt that many a uterus has been perforated by a curette; but these were cases where the organ had been infected for a long time, so that its wall-tissue had become altered. It is manifestly illogical to cry down a means of treatment on the pretext that in clumsy or inexperienced hands it may give rise to accidents.

Again, generalization of infection after curetting is hardly to be apprehended when the intervention is performed at a time when the *caduca* is infected with microbes on its surface only. The severe rigor (reinfection fever) which quite often follows the intra-uterine treatment of which we are speaking, has usually no serious meaning, the fever falling rapidly afterwards. It can, besides, be avoided, by painting the inner surface of the uterus with tincture of iodine an hour or two before curetting.

After curetting or brushing, the cavity of the uterus should be washed out with two litres of Tarnier's iodized-iodine solution, and the operation should be ended with a cauterization by means of a swab dipped either in creosote and glycerin 30 per cent.,

tincture of iodine, or alcohol. Plugging of the uterus is only necessary in case of persistent hemorrhage after curetting, dependent on lack of tone of the muscle.

This complete intra-uterine treatment, when applied early in the infection, gives excellent results; in the great majority of cases the fever falls rapidly to the normal and remains there. Recovery, furthermore, is definite, and is rarely complicated with serious conditions, such as metro-salpingitis, phlegmatia, etc., that occur so frequently when uterine infection is treated by the timid method of vaginal and uterine injections.

When, in spite of curetting, the fever continues, it is necessary to give intra-uterine injections with permanganate, or peroxide, as long as the cervix will allow the canula to pass.

When necessary the treatment can be combined with painting of the inner surface of the uterus with tincture of iodine, or alcohol. Dernelin and Petit have recently recommended the use of a leucocytogenic serum, or heated normal horse serum; a piece of gauze tissue is soaked in this serum, inserted into the uterus, and left there for twenty-four hours. This process can be repeated five or six times. The serum acts by favoring a local call for polynuclear leucocytes which act as protective subtones.

When the continuation of the accidents appears to be due rather to hindered lochial flow, the uterus can be drained either with two big india-rubber tubes or with one metallic tube.

b. If on the other hand, the infection is a long standing one, a week or more, and there are severe rigors with signs of infection either para-uterine or general, the curette and brush are equally dangerous. They injure the uterus, and destroy the zone of leucocytic reaction of the mucous membrane, which in these long-standing cases needs to be carefully respected. Instruments are to be feared, as the uterine wall, very thin in places, is extremely friable. Finally, such an intervention is generally useless, as the foe has already got beyond the caduca, which is all that can be reached with the curette.

All that can be done in such cases is, after prudently removing the débris with the finger, to paint the cavity with iodine, or glycerin and creosote. Uterine injections can be prescribed on the days following, as often as necessary, or even continuous irri-

gation may be employed. Drainage, or dressings with the leucocytogenic serum, are also indicated.

II. THE UTERUS IS EMPTY.—Digital exploration of the uterus shows that the cavity is empty, and that the inner surface of the organ is smooth and regular.

If in such cases the fever is unimportant, and of recent date, an intra-uterine injection should be made with an antiseptic that is non-toxic and very diffusible, such as the iodo-iodized solution, permanganate of potash, or peroxide. A single injection, or at most two or three, is enough in many cases to bring the temperature down to the normal in a few hours. If, after twenty-four or forty-eight hours, the fever still persists, the uterine injections can be combined with painting of the uterine cavity with iodine, or with dressings with the heated normal horse serum mentioned above. But it is best in our opinion to proceed at the earliest possible moment to a thorough cleansing of the uterine cavity with the fingers, followed by brushing or curetting.

Pædiatrics

THE DIARRHŒAL DISORDERS OF INFANTS

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JUDGING from the number of cases and of lives lost each year, the intestinal disorders of infancy take on the character of a widespread epidemic. As is well known, in city communities, from 15 to 20 per cent. of the children born fail to reach their second year and a large proportion of their deaths is the result of intestinal disturbances. This alarming infantile mortality has long been recognized by physicians, but it is only during recent years that the public in general and government officers have realized the extent of the sacrifice of human life and have begun earnestly to adopt measures to reduce it.

The liability of infants to contract diarrhœal disorders has been known from very early times. The malady was recognized by the Greek and Roman physicians and by Rhazes, the Arabian scholar, who describes a form of infantile diarrhœa due to the corruption of milk from bilious humors.¹ Sydenham² in the early part of the Seventeenth Century left an excellent description of the disorders as we now know them. It was recognized that the disturbances were due to intestinal derangements brought about by improper diet and that they occurred chiefly among the children of the poor in crowded communities. The relation of the diseases to high atmospheric temperature has long been known. These disorders seem to have been frequent in the growing cities along the Atlantic seaboard even before the Revolution, and attracted the attention of Dr. Benjamin Rush, who was perhaps the first in the country to call attention to their importance. Dr. Rush notes that the disease is frequent in proportion to the heat of the weather and

that children from the first four weeks of life until they are through their second year are most liable to its ravages. Dr. Rush emphasized the importance of light clothing in warm weather and stated that the removal of the cases from crowded communities to the country was helpful.

The general lines of treatment suggested by Sydenham and Rush are still followed; namely, the emptying of the intestinal tract and the substitution of a cereal water or broth for a milk diet.

The occurrence of these disorders among infants in epidemic form and the clinical features of the cases themselves led practitioners from early times to suspect the infectious nature of the affections. Naturally with the advent of the science of bacteriology, microorganisms were sought for as the cause of the ailments. Many organisms have been isolated from the diarrhoeal stools which were found to be pathogenic for laboratory animals and which were thought by various investigators to account for the epidemics.

It was shown by others, notably Escherich, that bacteria known to be regular inhabitants of the intestinal tract, under certain circumstances, can become harmful and give rise to serious symptoms. This he showed to be true of the colon bacillus. Flügge³ called attention to the presence of several strains of anaërobic peptonizing bacteria which produce spores and are not destroyed by ordinary methods of heating. These organisms do not curdle milk and are thought by Flügge to be the cause of many diarrhoeas occurring among infants.

Tissier⁴ also has recently described an anaërobic peptonizing bacillus which he thinks causally related to certain cases. Many observers have demonstrated the presence of streptococci in the diarrhoeal stools. It is still undetermined whether they are not secondary invaders of the intestinal tract, and perhaps more concerned with the production of the anatomical changes in the mucosa than with the primary infection. *Proteus vulgaris* and *Bacillus pyocyaneus* have been described in certain cases.

The investigations referred to and many others, although they showed that some instances of diarrhoeal disease among infants may have been produced by certain microorganisms, did not establish the causal relationship between any single organism and a large group of these infantile disorders. The discovery, therefore,

in 1902 by Duvall and Bassett⁵ in the laboratory of the Thomas Wilson Sanitarium of the dysentery bacillus in the dejecta of a large series of cases was of special interest. This organism had been isolated first by Shiga in cases of epidemic dysentery in Japan, and shortly after by Flexner in similar cases in the Philippine Islands, and by Kruse and others in smaller epidemics of dysentery occurring in asylums and almshouses.

A careful clinical study of the infants in whose dejecta dysentery bacilli were found failed to detect any special feature that served to distinguish specific cases from those of the usual summer diarrhœas. The organisms were found most abundantly in mucopurulent stools with or without blood, but were present also in mild cases of fermental diarrhœa which yielded promptly to ordinary methods of treatment. This work was confirmed the following summer by a number of investigators working under the direction of the Rockefeller Institute.⁶ Of 412 cases of summer diarrhœa examined, dysentery bacilli were found in the stools of 279, or 63.5 per cent. There were marked differences in the percentage of successful isolations in the hands of various workers.

It would seem, therefore, that in a considerable number of cases of the diarrhœal disorders among infants in the summer, there is the same reason to associate causally the dysentery bacillus as there is to consider it the active factor in epidemic dysentery among adults. The claim was never made that in the discovery of the dysentery bacilli in the stools, the etiology of summer diarrhœa had been cleared up. Many other important factors have always been recognized. The increased incidence of the affection with a rise in the atmospheric temperature has long been known and has been elaborated convincingly by Seibert. Unhygienic methods of living are also potent factors in the spread of the epidemic. Many cases of diarrhœa in infancy are due to abnormal products of digestion without the necessity of additional infection from without. Every physician having to do with feeding infants is familiar with the large number of cases in which, because of lowered digestive capacity from heat, teething, or intercurrent disorders, a milk mixture previously perfectly suited to the infant is either vomited in large curds from the stomach, or passing into the bowels sets up a diarrhœa. Many of the summer diarrhœas begin in this manner,

and the part played by the dysentery bacillus is thus made more difficult to determine accurately.

The problem is further complicated by the discovery that cultural reactions and agglutination tests divide the dysentery bacilli into a number of groups. Two important varieties are now recognized, the original strain as described by Shiga which does not ferment mannite with acid production, and a closely related strain which produces acid when grown in a mannite-containing media. It was the latter variety which was isolated by Flexner in the Philippines, and, therefore, called the Flexner strain.

The so-called acid forms have been further divided by slight cultural differences into a number of subgroups. All these Park considers sufficiently different from the original Shiga strain to call them paradysentery bacilli, and Kruse, pseudodysentery bacilli. Whatever view is taken of the bacteriological classification, it is certain that both varieties of the organism, the original Shiga and the mannite-fermenting strains are associated with diarrhoeal disorders. More important from our standpoint are those forms found most frequently in infantile diarrhoeas, belonging to the acid mannite group.

Thus in an examination by Schorer and the writer⁷ of a consecutive series of 74 cases occurring at the Wilson Sanitarium, dysentery bacilli were isolated in 42 cases. Of these in but three was the original Shiga bacillus isolated alone, while in 20 cases the acid producers were the only pathogenic forms found. In 13 cases several members of the dysentery group were present together, and in 11 additional instances streptococci were isolated in association with some form of the dysentery bacillus. This finding, if shown to be true in other localities, is important, as it suggests a reason, as will be shown later for the small measure of success of the antidysentery serum in the treatment of diarrhoeal disorders in infancy. It also indicates, as has subsequent experience, that the Flexner organism and its more closely related strains may occasion the most intense form of intestinal infection and be accompanied by extensive changes in the intestinal wall. Epidemics of diarrhoea produced by the Flexner strain of the dysentery bacillus have been described by Jehle and Charleton,⁸ Auché and Compagna⁹, Morgan,¹⁰ Kruse¹¹ and many others. Flexner and Sweet¹²

in an experimental study have shown that both strains are nearly equally toxic and produce similar intestinal lesions.

The method of propagation of the dysentery bacillus is still largely undetermined. It is biologically closely related to the typhoid bacillus which is conveyed to the patient chiefly through water and by direct contact. It has apparently no natural habitat outside of the human body and has not been found in animals except as a direct result of exposure from infected cases. There is abundant evidence that dysentery bacilli may remain viable for long periods in the intestines of patients after the cessation of all symptoms, and they may be harbored also by well persons who have been exposed to infected cases. The very small number of instances in which the organism has been found, after most careful search, in healthy individuals renders it improbable that the dysentery bacillus is a normal inhabitant of the intestinal tract.

These facts would seem, therefore, to suggest that certain epidemics of dysentery among adults and many cases of infantile diarrhœa are produced by bacilli from the intestines of ill or convalescent patients, or from those exposed to these diseases. These bacilli are conveyed to the infected individual by direct contact through fomites, by insects, particularly the house-fly or through drinking water. In an analysis of a series of infants in Baltimore,¹³ a surprisingly large percentage were given unboiled city water, either with or between their nourishments. The simultaneous occurrence of the disease in widely separated parts of our large cities among children receiving milk from entirely different sources, or frequently in infants taking condensed milk or breast-fed, suggests a common carrier, such as water, as a possible means of spreading the infection in cases thought to be due to the dysentery bacilli.

CLINICAL FEATURES

Much confusion has arisen from the attempt of writers to divide the diarrhœal disorders of infants too minutely on the basis of their clinical manifestations. Many different terms have been used to describe similar conditions. Several broad distinctions, however, are perhaps permissible.

1. The *simple* or *eliminative diarrhœas* produced by some gross indiscretion in diet. In these cases there may be pain and nausea

followed by frequent fluid stools. These are usually fecal in character. There is little or no elevation of temperature, and when the intestinal tract is emptied the symptoms quickly subside.

2. *Toxic diarrhœas*, including (a) the fermental or dyspeptic diarrhœa. These are the more common and form a large proportion of the so-called summer diarrhœas of infancy. The cause of these disorders has already been referred to. They may be the result of toxic material ingested or produced by abnormal or sluggish digestion, or by bacterial action. After a prodromal period of malaise and anorexia the acute symptoms are usually ushered in by nausea and vomiting followed by diarrhœa. The stools at first fecal soon became green and mucous in character and occasionally are slightly blood flecked. There is always a rise in temperature and pulse-rate, and there is evidence of more or less intoxication. In certain of these cases the process seems confined to the intestinal contents and in others the mucosa is markedly swollen. The mesenteric glands are always enlarged. In the large majority of instances, if the bowels are thoroughly emptied and the offending diet stopped, the symptoms disappear. The danger lies in the possibility of intense toxæmia from the absorption of poison from the intestinal canal, or in the development of a marked inflammatory process in the intestinal wall. Occasionally there are symptoms of acute gastro-intestinal intoxication with little or no diarrhœa.

b. *Cholera Infantum*.—This is the most fulminating form of the toxic diarrhœas. The term should be reserved for those very rare instances of intense intoxication in which there is high or subnormal temperature and very frequent watery stools with great pallor and prostration. The majority of these cases end fatally in a few hours.

3. *The Inflammatory Diarrhœas*.—In this form, in addition to the symptoms of the fermental diarrhœa, there is often more or less extensive alteration of the intestinal wall. This may be simple congestion with petechial hemorrhages, infiltration of the mucosa with inflammatory products, or definite loss of substance by ulceration. With this change in the intestinal mucosa, there is usually elevation of temperature, although in some cases of marked ulceration there is little fever. This is more often seen in the marantic infants with lower power to react to deleterious influences. The

course of this form is usually longer, lasting sometimes several weeks or months. The large bowel is more often the site of the principal lesions, although the mucosa of the lower ileum is frequently the seat of hemorrhage or ulceration. Tenesmus is often noted.

The character of the stools gives the most reliable information as to the condition of the bowel. In a recent analysis¹⁴ of 100 cases with autopsy the presence of pus and blood or of pus alone in 90 per cent. of the cases indicated either a thickened infiltrated intestine or the presence of ulcers. The absence of these materials, however, on macroscopic examination does not preclude the possibility of extensive inflammatory change. The microscopic examination of the stools is of great importance, as the number of pus-cells in the mucus indicates in a general way the extent of the bowel involvement. The diagnostic importance of the leucocytes in the diarrhoeal dejecta has recently been emphasized anew by Nobecourt and Rivet.¹⁵

Various forms of ileocolitis are described in accordance with the portion of intestine most affected and the character of the process. Membranous ileocolitis is rare in children, and it is only to be distinguished by the presence of the membrane in the rectum or by the passage of a fragment in the stools. Inflammation of the colon with little involvement higher up is particularly common in marantic infants. Hemorrhage of large amounts of blood is most unusual, and still more infrequently do the ulcers perforate the bowel wall. Ileocolitis often becomes chronic and persists for months. The pathetic picture of the gradually wasting child with little or no appetite and the frequent mucous or mucopurulent stools is a familiar one, especially during the latter part of the summer. In these cases nervous symptoms are prominent. There may be stiffness and contractions of the extremities resembling that in meningitis. The progress of the disease is often marked by periods of improvement. Many of these cases finally recover, but the mortality rate is large even when the infant receives every care. Death often results from some intercurrent affection.

The blood of infants suffering from various forms of intestinal disorders has been studied by several writers. There is an apparent increase in the hæmoglobin percentage and in the number of the

formed elements in the blood as usually determined in infants who have had many fluid stools, or who are wasted, due to the greater concentration of the body-fluids. The white cells have been studied by Japtha¹⁶, and by Warfield and the writer.¹⁷ They found a well marked leucocytosis in both the toxic and the inflammatory forms. The proportion of polymorphonuclear cells was much increased in the severe cases, so that the white cell count resembled that of the adult more than that of the infant. This finding is of some help in determining the severity of the infection.

One feature that has been frequently marked in our cases and which has not attracted the attention it deserves is the fatty degeneration of the liver. This organ receives a large share of the toxins absorbed from the intestinal tract, and in a considerable number of infants coming to autopsy, extensive fatty alteration has been present in the liver.

PREVENTION AND TREATMENT

The large proportion of cases which occur each summer among neglected, badly fed infants of our large cities suggests forcibly what general measures are of most service in preventing these diarrhoeal disorders. Most important, of course, is the feeding. Breast-milk should be continued whenever possible. Every baby has a natural right to its mother's milk, and if deprived of this, to clean cow's milk, of the best quality, properly modified for its needs. It is nothing less than criminal neglect for health authorities in crowded communities to permit the sale of a food-product possessed of such possibilities for harm, except under such supervision as will assure its quality. The modification of the milk should be directed by the physician, but the mother or nurse should be instructed to weaken the mixture during unusually hot weather, or when the baby does not seem so well.

In warm weather it is unquestionably better to pasteurize the milk: 140°F. for one half hour as suggested by Freeman¹⁸ is sufficient. It has been shown by Schorer and the writer¹⁹ that milk starting with a low bacterial count will sour in 24 to 36 hours in ice-chests that are not kept below 60° F.

Bottles and nipples must be cleaned and boiled before using. All the water used should be boiled. Special care should be taken

as to the disposal of soiled napkins and bath-water. Every case of diarrhoea in the household should be regarded as a centre of infection, and such precautions as have been found effective in the care of typhoid fever patients should be enforced. Especially important is it to keep the patient screened from flies.

Other measures though less urgent than the feeding are distinctly helpful. The child should have an abundance of fresh air; it may be better for him to sleep out doors day and night. The clothing should be changed with the temperature, and not with the season as appears to be the present custom. Just as little as is necessary to keep hands and feet warm is a safe summer rule in our climate.

As has already been indicated, the treatment of diarrhoeal disorders of infants in vogue at present follows in general the outlines suggested by physicians for many years. Change of air to sea-shore or mountain has proved of great service even after the illness has commenced, but must not be advised unless it is possible to secure, away from home, satisfactory quarters, good nursing, and suitable diet. In all cases of diarrhoea there is more or less congestion of the intestinal mucosa and increased peristalsis due largely to the irritant action of the improper diet. Nature's effort to eliminate the offending material should be assisted, never in the early stages, interfered with. Castor oil and calomel have proved the most satisfactory purgatives and should be given promptly and in sufficient quantities to empty the intestinal tract. One or two drams of the former, repeated if necessary, will generally suffice. The calomel is preferred when there is much nausea and vomiting, or evidence of marked toxæmia. Calomel is possibly of service in checking the fatty changes in the liver already referred to. It may be given in divided doses until the stools appear green. Small doses of Epsom salt as recommended by La Feha are often helpful. If nausea is persistent, nothing relieves it so much as gastric lavage; a little lime-water may be left in the cleaned stomach. When there is high fever, drowsiness, or other evidence of intestinal intoxication, improvement often follows a flushing of the large bowel with normal salt solution. The fluid is best given from a fountain-syringe through a large catheter introduced without force into the elevated rectum. Two or more quarts of salt solution may be used

and as much as possible of clear fluid allowed to remain after the irrigation. If there is high temperature the irrigation should be cool. The same procedure is useful in cases of ileocolitis when the principal lesion is in the large intestine. Here various astringents, such as witchhazel, alum, and tannin can be tried. Silver nitrate followed by salt solution has in my hands proved of most value in promoting healing of the ulcerative cases. The salt solution is rapidly absorbed from the bowel and serves to flush the kidneys. Hypodermoclysis of normal salt solution is, perhaps, the quickest means at our disposal to help the small patients to overcome the toxins in the circulation. It is best to use two needles inserted in the loose tissue of the abdomen. A central tube introduced into the infusion bottle through which the air bubbles as the fluid leaves the bottle, enables one to control the rate accurately. One hundred to 300 c.c. may be given in an hour or more. It should be given slowly.

When the temperature is falling and the effects of the poisoning are less, the diarrhoea may be cautiously checked with bismuth subnitrate, subcarbonate or a chalk mixture. Opium in any form should be given only for a specific purpose. When there is great restlessness and irritability, marked tenesmus, there is no drug which takes its place. It may be administered as paregoric, laudanum or hypodermically as indicated. Children are susceptible to morphia and more than $1/200$ to $1/50$ of a grain is rarely needed. This, however, can be repeated. Stimulants are required in many cases. Alcohol in the form of whisky or brandy from $1/4$ to 1 oz. in 24 hours well diluted serves to steady the pulse and improve the general condition, especially when there is marked prostration. Strychnine and digitalein, musk and camphor are often helpful. Strychnine was found by Cook²⁰ some years ago at the Sanitarium to have the most lasting influence upon the blood-pressure of any of the stimulants tried.

The dietary treatment of these infants is perhaps the most important. In acute cases with fever the milk should be stopped at once and not given again until all acute symptoms have passed and convalescence begun. If the child's general condition is good, it is better to give nothing by mouth except boiled water for several hours,—it may be for several days. This water period cannot be

continued so long with weak and emaciated infants. With them and with the others later as the symptoms subside, cereal water, preferably dextrinized, may be substituted. Egg albumin and beef-juice, and later broth may be added. Weak tea, used so much in Europe, has proved in our hands of distinct value. Cereal waters are indicated, according to Escherich, when the stools are offensive, especially suggestive of proteid putrefaction, while the albumin, beef-juice, and similar foods are particularly useful when the dejecta are acid. In certain cases of fermental diarrhoea with foul-smelling stools, large numbers of lactic acid bacteria given in pure culture or in buttermilk are certainly serviceable in checking the fermentation and allaying symptoms. Condensed milk in weak dilutions is also helpful for a short period in early convalescence. Milk low in fat and treated with sodium citrate, 1 or 2 grains to the ounce, and then diluted, may also be tried. The return to a milk diet should be gradual. Experience has shown that the ingredient in milk most difficultly borne by these infants is fat; hence, skimmed milk, often peptonized, may be given before whole milk or cream mixtures.

The cases of ileocolitis extending often over weeks present the most difficult problem to the pædiatrician. He must select such a diet as will afford nourishment, and as far as possible be digested high up in the intestinal tract. A knowledge of percentage feeding is of the greatest service in these cases. One should know the calorific value of the diet used and try if possible to give the patient at least 30 calories per pound of body weight in 24 hours. The diet must be changed frequently as these infants have fitful appetites. In rare instances only is lavage of any service. Occasionally a baby will retain food given through a stomach-tube or nasal catheter, which would be vomited if fed with a bottle.

Shortly after the discovery of the Shiga bacillus the treatment of bacillary dysentery by the use of antitoxic serum was undertaken. Most encouraging results were obtained by its use in Japan, where the death-rate was reduced from 30 per cent. to less than 10 per cent., and a marked improvement in the general symptoms brought about. It was naturally hoped that as organisms belonging to the dysentery group are so frequently present in these diarrhoeal stools of infants, that the antidysenteric serum would prove of great

benefit in these cases. A number of infants were so treated at the Wilson Sanitarium in 1902 and later in many places under Dr. Flexner's direction.²¹ As is known the results were disappointing. Of 87 cases receiving serum, in only 12 was any betterment noted afterwards and in nearly every instance the improvement could be readily attributed to other factors. Notwithstanding, reports from many sources confirm the value of the serum in adult dysentery. In the Russian-Japanese war several epidemics of dysentery were cut short by its use. Striking results have been reported by Rosculet²² in Roumania, Ludki,²³ Auché and Campana,²⁴ Coyne and Auché,²⁵ Vaillard and Dopter,²⁶ and many others. The latter investigators have collected statistics of 200 cases treated by the serum with a surprising mortality of only 2 per cent. Of 43 additional cases occurring in insane asylums, all but five recovered.

Further clinical experience and laboratory experimentation has suggested some explanation of differences in the results with the serum in adults and infants. It has been shown by Conradi, Neisser, and Shiga, Rosenthal, Flexner, Kraus and Doerr, and others, that bacilli belonging to the original Shiga strain produce in cultures or in suspension a definite soluble toxin against which an antitoxin has been obtained from the serum of immunized animals. This serum has been shown by Kraus and Doerr to neutralize the toxin both *in vitro* and in the body of a susceptible animal and to be curative when it follows the toxin even after a considerable interval. It is evidently serum of this kind that has brought about such beneficial results in the hands of so many investigators. However, as yet no active soluble toxin has been produced by these acid-forming bacilli. In this respect these organisms resemble the typhoid bacilli. As has been said, in our experience in nearly all the cases the organism found belonged to the mannite fermenting group, and hence they were little affected by the serum prepared during the summer of 1902 and 1903. Coyne and Auché in the article referred to have reported eleven cases of dysentery produced by the Flexner type of organism treated by a polyvalent serum with a markedly curative effect. The graver cases needed several injections. It is possible that this result may have been due to the antitoxin against the original Shiga bacillus and not to the antibody produced against the Flexner organism, for

as these authors state, an immune serum prepared exclusively from the Shiga type possesses towards the Flexner type the same protective action that it exerts against the Shiga organism. Kruse²⁷ has lately called attention to the importance of aggressines in the production of antidyentery serum.

It is to be hoped, therefore, that further study will discover a method of producing an antitoxin to the Flexner variety of the dysentery bacillus and its closely related mannite-fermenting organisms, and put into our hands a means of directly combating a considerable group of the diarrhoeas of infancy.

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CHRONIC MILK INFECTION (MARASMUS)*

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GENTLEMEN: This girl baby, about three years of age, has been under treatment by Doctor English, my assistant, for several months, and you will observe the child presents a pitiful picture to-day, not yet well. This may appear strange, as we would ordinarily think that whatever might be the disease from which she suffered, recovery ought to have taken place in three months.

Notice the general appearance of this child; without asking any questions you can easily observe that her health is far below par. She is nearly three years old, yet in size she resembles a baby not more than one year of age; she is greatly emaciated; observe how thin her legs and arms are, the skin especially about her legs has a leathery, wrinkled appearance. She is peevish and fretful, and cries almost constantly. There is a history of long-continued diarrhoea, capricious appetite, and progressive emaciation. There is some induration of the superficial lymphatic glands in the inguinal region of each side.

This child presents a typical picture of long-continued suffering. The mother tells us that occasionally she has noted blood in the stools, "stringy blood," as she describes it. We find that notwithstanding the unfavorable general condition of the child that she has cut all her deciduous teeth.

The diagnosis of marasmus has been made in this case. As you are aware that term is largely a misnomer—it simply means an emaciated, rundown, condition—it is without any pathological significance whatever. You may have a marasmatic condition from long-continued diarrhoea, again it may result from a tuberculous or strumous diathesis. On further inspection we find there is

* Clinical lecture delivered at the University of Louisville, Medical Department.

some induration of the mesenteric glands, and this may bear a more or less intimate relationship to the continued and progressive emaciation. This child, according to the history, eats quite as frequently and probably as much as the average baby at her age, yet the emaciation continues, the stools are too frequent, and now and then contain strings of blood.

We must remember that the so-called marasmus may be produced by subacute or chronic colitis or proctitis, or, indeed, anything which depreciates the general health for a prolonged period. I apprehend that in this case, from the best information we are able to obtain, we have an infection of the colon, most likely about the sigmoid flexure, not dissimilar to the condition observed in the adult suffering from chronic dysentery. As you know in the adult, especially in the male, cases are not infrequently observed where the patient will continue for many months with subacute or chronic dysentery, passing a little blood with the stools perhaps three or four times a day where emaciation is progressive, yet the patient will probably be able to keep on his feet and even attend to business for several months.

This child has long-standing diarrhoea, with blood in the stools now and then, she is wasting away, there is enlargement of the inguinal lymphatic glands, and so far as we can determine from our examination the mesenteric glands are likewise enlarged and indurated—the so-called *tabes mesenterica*. There is a possibility that we have here a tuberculous diathesis to account for the trouble, but I do not quite concede that this is the cause, since there are many other things that might induce or act as a determining factor in the production of the glandular enlargement which we find present. It must be remembered that the mesenteric glands are situated between the two layers of peritoneum which form the envelope for the intestines, and in this situation they act simply as little filtering plants along the route of each lacteal as it leads from the intestine to the thoracic duct. These glands are put there for the purpose of filtering the lacteal fluid (nutrient material) after digestion and carrying it back to the blood. If there is any inflammatory lymph in the material taken from the mucous surfaces of the bowel, it is arrested in its progress by these mesenteric glands; if inflammatory material continues to be absorbed from the intestines, the glands,

after a while, become subacutely inflamed, or rather an hyperplastic condition develops; if this hyperplasia continues there will ultimately result an induration or hardening of the gland structures, and after a while the entire contents of the gland will degenerate, and instead of normal glandular structure there will be present only cheesy material. The whole gland is occluded as well as the lymphatic duct which leads to it, therefore nutrient material can no longer pass through that series of filters to the thoracic duct and progressive emaciation is the natural result. That is briefly the manner in which the mesenteric glands figure in the so-called *tabes mesenterica*, or enlargement of the mesenteric lymph-nodes.

Whether that is really the condition in the case before us, could not be decided before autopsy, but where there is long-continued and progressive emaciation associated with enlarged lymphatic glands in the inguinal and other regions, we are led to infer that the emaciated condition may be due to *tabes mesenterica*. It stands to reason that this may be the pathological condition in this case. There has been decided interference with the passage of nutrient material into the blood, and as a consequence there is continued emaciation, notwithstanding the fact that the child apparently eats everything offered to it according to the history given to us by the mother who is present.

Now, what can be done; if that is the pathology, what can we do to correct it? As usual the burden of proof rests upon us; we are called upon to correct the abnormal condition which we find present. I believe the infiltration of the mesenteric glands is sufficient to explain the existing marasmatic condition; I believe further that in the majority of such cases the area from which the inflammatory material has been carried to these mesenteric glands is in the lower segment of the colon, possibly the sigmoid flexure; it may be the rectum itself. The upper third of the rectum is quite a favorite site for infections of this kind. Acute or even subacute enteritis higher up in the tract would probably have terminated fatally before this time. The very fact that the disease has continued for considerable time convinces me that the focus of infection is located in the lower segment of the bowel. Had this child suffered an infection of the mucous membrane of the ileum, and that is the most common place for inflammatory lesions, *i.e.*, in the lower

third of the small intestine, then in addition to other symptoms there would have been vomiting, nausea, loss of appetite. Furthermore she could scarcely have endured this three months of enteritis of the small intestine. A patient may live a long time with proctitis or sigmoiditis, just as the soldier may continue on the march for several months with chronic dysentery. This child now has—and I take it our diagnosis based upon the history is correct—an infection of the lower segment of the colon, with an hyperplastic condition of the mesenteric lymph-glands.

What are we to do? The first thing, as we all know, in a condition of this kind, is to eliminate if possible the cause of the trouble, and granting that our theory is correct we must go back and see just what has been the cause of the present trouble. It may have been contaminated milk; of course, it may have been something else, but milk is the most likely source for the infection. There is so much to be said about milk that we cannot discuss the question in this lecture, except to say that of all the culture media for the growth and elaboration of germ life, there is nothing better than milk. Any form of aerobic germ introduced into milk begins at once to propagate and multiply. You may take a cup of fresh milk, drawn from a cow in the country where there was no chance of infection, set this cup of milk in an ordinary living room for an hour where the temperature may be 80° F., and if the milk is saved for twenty-four hours, millions of bacteria may be demonstrated therein. If one introduces such milk into a child's stomach, the temperature of the body being about 99° F., together with the germs that have already dropped into the milk and begun their multiplication, the bacterial flora increase at a rapid rate and in two or three hours they multiply many times. Acid fermentation usually occurs in the stomach during the digestion of casein, which adds another element of irritation, and the partly digested masses create additional disturbance as they pass along the intestine, but more especially does this apply to the colon. Milk modified in this way, teeming with bacteria, has a decided tendency to continue the inflammation of the mucous membrane, when once it is set up, and the mucous surfaces furnish a good field for the further proliferation and growth of the bacteria. That is probably what has occurred in this case. If we could see the interior of this child's colon I dare

say we would find it denuded of epithelium in many places, and if we could examine the stools we would find evidences of epithelial flakes therein.

Again we have to ask, what shall we do? Of course the necessity for correcting the diet of this child goes without the saying. She should not be fed milk in any shape or form. Fresh animal broth, as well as gruel freshly prepared, is an excellent food for a child of this age. Of course in the preparation of food by domestic cooking the heat applied ranges from 300° to 400° F. and all germ life is thereby destroyed, and if eaten at once such food is necessarily sterile. The albuminous foods, oils, fats, etc., are indicated in a case of this kind. Starchy foods may also be given; baked potatoes, thoroughly done, form an excellent food, especially if you use only the half next the skin. This is said to be vastly richer in starch and more easily assimilated. If you have an acute taste you can easily tell the difference between that part of a baked potato which comes from nearest the skin and that from the centre. The gravy made from frying fresh beefsteak is one of the best foods I know of to use in a case of this kind. One may also give some of the meat juices, liquid peptonoids, etc. Many of the ordinary soups are also good, especially that made from a beef "soup bone," which should be boiled for an hour to remove the gelatin from the bone and the oil globules out of the marrow; this makes an excellent domestic food.

We will give the mother of this child instructions which she can carry out at home. Poor people cannot take advantage of the luxuries of a private room in a hospital and a trained nurse. Even in the better walks of life and in the middle class we have to give instructions which can be easily understood and followed where treatment is instituted at home. If this child should have anything in the way of milk, I believe buttermilk would be the most wholesome method of administering it. The lactic acid which buttermilk contains probably accounts for the few bacteria found in it, i.e., the lactic acid destroys the germs. From clinical observation we have frequently demonstrated that buttermilk is a very satisfactory food.

Probably a better and more expressive designation for the dis-

ease represented by the case before us would be chronic milk infection, rather than marasmus or *tabes mesenterica*.

Believing that we are correct as to the existing pathology, *i.e.*, that there is an infection of the colon or sigmoid flexure, we will irrigate this baby's bowel. We will do just what the surgeon would if he had a sequestered mass in a cavity, we will wash away the sequestrum and provide for adequate drainage. This bowel does not drain the mucous membrane sufficiently, and we will try and improve the situation by a thorough irrigation with normal saline solution. We will thoroughly cleanse the colon from which these bloody stools have originated and we will also disinfect this area by the use of salt solution. As you know, normal saline solution may be prepared by adding about three grains of the chloride of sodium to an ounce of water, or a teaspoonful to a pint. Our object is to make a soothing application to the inflamed mucous membrane, and at the same time to use something which will clean it for the time being.

As soon as our apparatus can be put in readiness we will irrigate this child's rectum and colon with salt solution. We will give her some liquid peptonoids as medicine. We will also instruct the mother to feed her wheat bread, to take some stale bread three or four days old and toast it thoroughly on both sides until it is brown. Of course we know this toasting process simply converts the parts toasted into maltose, which is more easily digested and assimilated than untreated bread. The same result may be secured by using zwiebach which is already prepared. She will be given this toasted bread, no sweet cakes or pastry of any kind, plenty of beef gravy, fresh soft boiled eggs, beef soup, baked potatoes, and as medicine we will prescribe a tablespoonful of liquid peptonoids three or four times a day. I expect in this case to do another thing, *i.e.*, cover the whole area of the abdominal wall with mercurial ointment, and direct that a fifty per cent. mercurial ointment be rubbed into the skin over the abdomen every night. We want to obtain the effect of mercury in this case in one way or another. I do not wish to give the child calomel or any other medicine, for we desire to save her stomach for nutrition. Inunctions of mercury will give the desired result. If it so happens that we are mistaken in our premise, and the trouble is due to a specific

or strumous diathesis, which is not impossible; or if it be due to some other dyscrasia, good may be expected to result from the use of mercury. We do not know just how mercury acts, but we do know that it is a wonderful remedy in many respects, especially where there is glandular induration.

We intend to treat the colon in the manner indicated because of the evident infection, and, further, because of the bloody stools. There is not constant hemorrhage from the mucous membrane of the bowel, because sometimes during a period of twenty-four hours, although she may have several evacuations, no blood will appear. We will irrigate the bowel with saline solution, and it is only fair to say that this method of treatment does more than to cleanse and disinfect the mucous membrane of the bowel, for the salt solution is taken up by the circulation, reinforces the blood, and increases its plasma. We will use two teaspoonfuls of salt to a quart of warm water.

We find there is no excoriation around the nates. If there were present an enteritis, due to acid fermentation in the small intestine, there would be extensive excoriation about the anal region, the nates would be raw, but that is not true in this case.

We are using an ordinary fountain syringe to which is attached a soft rubber catheter. We will introduce the nozzle of the catheter just within the rectum and allow the water first to distend the rectal pouch, and then the tube may readily be passed upward. The patient may be placed on the side or the back, whichever is preferred. I believe the back is best, and that is the position we use in this case. Always use soap instead of vaseline or grease in lubricating the tube, for two reasons: first, soap is more slippery than grease; second, grease on a wet surface does not lubricate well. I have now distended the rectum slightly with salt solution and find the tube can easily be passed upward into the sigmoid flexure of the colon. By using a soft catheter there is little danger of inflicting injury even in young children, which would not be true if a hard tube were used. Care is necessary in the introduction of the catheter, otherwise it may turn upon itself and the solution will thus fail to reach the desired locality.

This is a class of work that you will always have to do yourself, as you cannot depend upon a trained nurse to do it for you satis-

factorily. Use plenty of the saline solution, and if some of it is retained for a considerable time, so much the better. There does not seem to be much fecal matter coming away; this is because the rectum and lower portion of the colon were evacuated this morning. We have now inserted the catheter its full length, and if it reaches the transverse colon it can do no possible harm. As the solution returns upon the Kelly pad we observe that it contains a large quantity of epithelial flakes but little or no fecal matter. This epithelial débris comes from the denuded surfaces of the mucous membrane of the colon. As soon as the saline solution reached the colon you doubtless observed that the child ceased crying at once. I believe this method of treatment will have a decidedly beneficial effect, and it should be repeated every other day.

Orthopædics

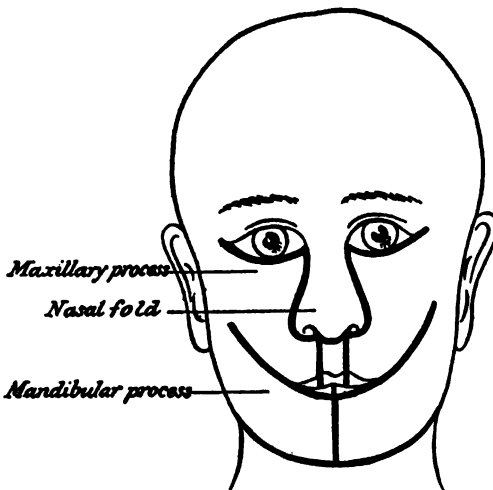
CLEFT PALATE AND HARELIP

BY F. N. G. STARR, M.B. (TOR.)

Associate Professor of Clinical Surgery, University of Toronto; Associate Surgeon, Hospital for Sick Children; Senior Assistant Surgeon, Toronto General Hospital -

To understand fully the requirements of treatment in cleft palate and harelip it is essential that one should understand something of the development of the face. We have been taught, that during the latter half of the first month of fetal life five processes

FIG. 1.



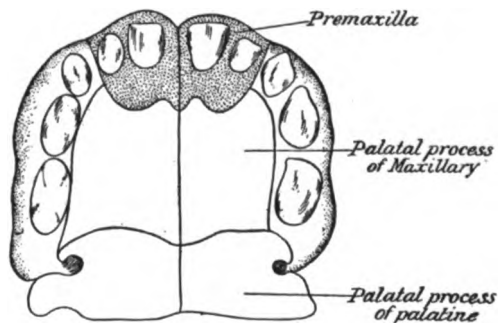
begin to show, springing from the base of the primitive cerebral capsule,—the nasal, two maxillary, and two mandibular (Fig. 1).

If the nasal and maxillary processes fail to fuse—because of amniotic adhesions—as they should do by the end of the second month of fetal life, the condition known as “harelip” is the result,

and if the failure occurs between the deep parts of these processes the condition known as "cleft palate" supervenes. From the mesial nasal processes are formed, by fusion, the premaxillæ and the nasal septum. In the premaxillæ are the sockets of the upper incisors. The premaxilla fuses with the maxillary process (superior maxilla), the latter overlapping and almost excluding it from the face (Fig. 2).

"The hard palate,—with the exception of the premaxillary part,—and the soft palate and its muscles with the uvula, are formed by a horizontal plate (palatal process), which grows inwards from the maxillary process and fuses with the plate of the opposite side beneath the septum of the nose, with which the horizontal plates also unite. The palatal processes separate the buccal

FIG. 2.



Showing (Keith) hard palate at birth. The premaxillary part is formed from the mesial nasal process; the remainder by the palatal plates in the maxillary process.

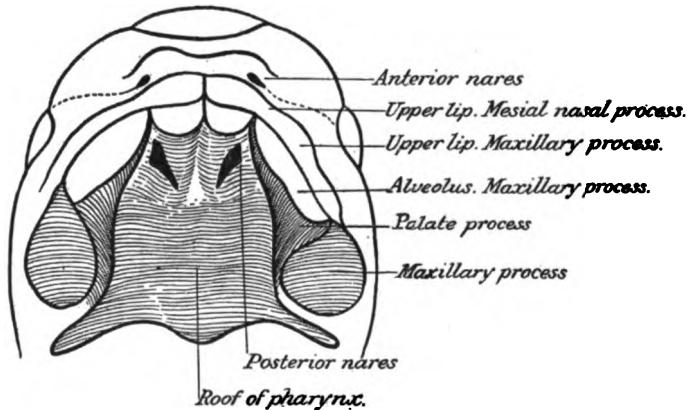
from the nasal cavities, forming the roof of the one and the floor of the other. The horizontal palatal processes meet first in front, the process of fusion spreads backward, and by the end of the second month it is complete."¹

It will readily be seen then that the condition of cleft palate is due to a complete or a partial failure of fusion (Fig. 3).

If fusion of these processes should occur at the second month of fetal life, and fails, then surely the proper time to bring about artificial fusion is as soon after birth as possible, for during the early postnatal developmental period, repair is very rapid, and healing takes place with but little reaction. The unfortunate in-

fant has not had time to become unhealthy from improper feeding; it is practically free from the possibility of bacterial autoinfection; there is no catarrh present, as in older children; there is rarely any sickness after the anæsthetic and the patient is able to take nourishment as soon as the anæsthesia is over. There is little or no evidence of suffering, and in my experience, the risk from hæmorrhage—sometimes so serious in older children—is practically nil. A further advantage is, that owing to the mere fact of having made nasal respiration possible, the nose, the fauces, the palate and mouth are more uniformly developed. The flattening of the nose, with its wide bridge and the accompanying breadth of face between

FIG. 3.



the eyes will be entirely overcome by early operation from the effect of the entrance and exit of the respired air. The greatest advantage of all, however, is that the child will learn to articulate without the so-called nasal speech, because when he learns to talk, the cleft has already been closed. The nasal and mouth cavities are separate, with a good air-chamber for the passage of air through the nose and through the resonating air-chambers which give rise to the normal intonation.

The question then arises, How early should an attempt at repair be made? To which I would answer, that I have successfully operated at the age of three days, and, if opportunity offers,

and I can get a competent anæsthetist with some nerve, I shall not hesitate to attempt the repair on a child *three hours old*.

It is true that this doctrine differs essentially from the usual text-book teaching, as will be seen from the following quotations: Lexer,² in Von Bergmann's System of Practical Surgery, says: "In what year of life may the operation for cleft palate be best performed? The conditions here are somewhat different from those in the operation for harelip, but here not only the closure of the cleft formation is to be considered, but also above all things the subsequent functional activity of the soft palate. On this account, as Gutzmann rightly advised, it is best immediately after the healing of the operated cleft to begin with systematic exercise of the palate muscles by means of instruction in a language. This can be begun, according to Gutzmann's experiences, in the fifth year of life at the earliest. At this age under ordinary circumstances and with strong children there is no danger to life in the operation itself; according to Kuster, absolutely no such danger exists after the third year. If in addition the fact, important for the psychical condition of the children, is considered that they must be free from this strange congenital deformity before beginning school, the present standpoint of most surgeons is readily explained when they place the best time for uranostaphyloplasty in the fourth to sixth or fifth to seventh year of life. From the author's experience in Von Bergmann's clinic, he cannot see that it is necessary to perform the operation on principle before the third year, although Wolff has shown that the operation may be performed still earlier, even in the first month of fetal life, without necessarily having to fear a lack of development in the transverse direction of the superior maxilla, as Ehrmann described as a consequence of the early operation.

"In complete labial maxillary palatal cleft the harelip operation, if necessary combined with the reposition of the intermaxilla, always precedes union of the palate. This, as mentioned above, causes not only an improvement in the nutrition, but also a diminution of the uranoschisma."

Treves,³ in his System of Surgery, says: "Whenever possible, operative treatment, having for its object the complete and permanent closure of the cleft, should be undertaken. In this

connection several points present themselves for consideration. Of prime importance is the question, At what age should the operation be performed? It may, I think, be laid down that, whilst it is never wise to operate upon a child under three years of age, the time of election is from this age up to six years. However severe and complicated the case may be, no advantage can accrue from postponing the operation longer than the sixth, or at the very outside limit, the eighth year."

Cheyne and Burghard,⁴ in their Manual of Surgical Treatment, put the matter in the following way: "The age at which uncomplicated harelips may be operated upon depends to a large extent upon the size of the gap. In slight, simple cases the operation may be done within a few weeks or even a few days of birth. If, on the other hand, the cleft is wide, extends up into the nostril and entails a long operation and a free separation of the soft parts from the bone with a considerable loss of blood, the operation should be delayed until the child is at least three months old. This must certainly always be the case in double harelip. In all cases, however, unless there be some very strong contraindication, such as marked marasmus, the operation should be performed before the occurrence of dentition."

"When cleft palate complicates harelip, the question whether the operations for uniting the harelip and the cleft palate should be done at the same time or separately has to be considered. It is a generally accepted rule, and one with which we are in the main disposed to agree, that the harelip should be closed as soon as possible, whether the operation on the palate be deferred to a later period or not. This is advisable, because the development of the parts improves directly the lip is united, the cleft in the palate, and especially in the alveolus, apparently tends to diminish and the nutrition of the child becomes better."

From a study of the last sentence here quoted note that they claim that, "the development of the parts improves directly the lip is united." If that is the case in the lip, why not in the palate?

It looks to the writer as if some one of the Early Fathers in Surgery had laid down a law as to the age at which the operation should be done—perhaps hoping that death from *malnutrition* might occur during the period of waiting—and that most writers since

have followed this lead with perhaps the same end in view, or because it never seemed worth while to think otherwise. But surely it is worth while when the child's ability to speak without nasal intonation depends upon the early operation.

It is often urged that if the lip is done first, the cleft in the palate narrows materially, and a less extensive operation will be required for its closure. While it is quite true that the cleft becomes less wide under such circumstances, yet to my mind it does not lessen the extent of the operation, for I think it may be laid down as an axiom that the older the child, the more grave is any operation that may be undertaken upon its palate. There is greater danger from hemorrhage, from infection and from shock.

Lane⁵ makes out a good case for operation upon the palate before the deformity in the lip is touched, and in most instances I agree with him. If the palate is done first access to the field of operation is easier, and the surgeon has better control of his technic. As a rule the cleft in the lip may be attended to at the same operation, with the one anæsthetic.

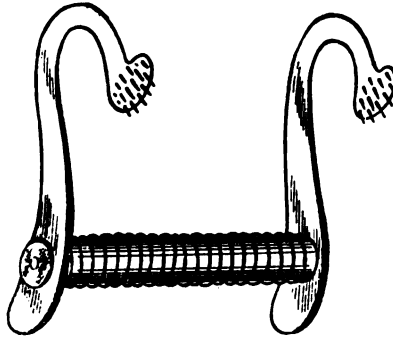
The flap operation as outlined by Lane is a most excellent one, and in his hands has given gratifying results. It seems to me, however, that unless the operation is done within the first few days of life, there is a serious risk of doing damage to the temporary teeth when it is necessary to go outside the alveolar margin for a large flap. Then, too, in older children one cannot go outside the alveolar margin because of the erupted teeth, and as it will probably be another half century before the profession really becomes alive to the advantages of early operation, I feel prone to recommend a modification of an operation already described by the writer.⁶

The patient is placed on its back with a small sandbag under the shoulders, and the occiput resting on the edge of the table. The anæsthetist is on one side, and should be prepared to administer oxygen at any moment in conjunction with ether or chloroform, whichever may be selected as the anæsthetic.

As a preliminary step to the operation the tongue is drawn well forward and a stout silk suture passed through it. The ends of this suture are then caught in a pair of artery forceps which in turn are clipped into one of the towels over the patient's chest and thus fixed, saving one hand of an assistant. A pair of Lane's gags

(Fig. 4) are now placed in position. The use of these gives splendid access to the field of operation; they do not interfere with the operator's movements, and the prongs readily fasten into the toothless gums. An incision is then made into the mucoperiosteum of the hard palate well out to the alveolar margin extending forward

FIG. 4.



Lane's Gag.

beyond the anterior extremity of the cleft,—if this does not extend through the alveolar margin,—and backward to a point just behind the posterior border of the hard palate. With a periosteal elevator, suited to the case, the mucoperiosteum is quickly denuded from this

FIG. 5.



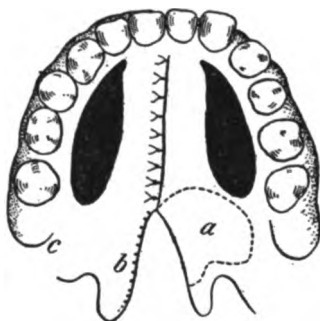
Showing primary lateral incisions.

side, when, with a pair of sharply curved scissors the palate aponeurosis is snipped from the posterior margin of the hard palate, thus freeing the flap from its bony attachment. This incision is now packed with a piece of sea sponge, and the surgeon proceeds to deal with the opposite side in the same manner. The

first packing may now be removed, when one, as a rule, finds that all hemorrhage has ceased. Returning to this flap again, the edges forming the sides of the cleft are carefully pared with a small tenotomy knife, cutting as thin a slice as possible, at the same time making certain to include the whole thickness of the flap margin. The denudation should begin posteriorly within the soft palate, but need not include the uvula. By the time the edges are pared on the one side, the packing may be removed from the lateral incision on the other, and the edges of that flap pared in a similar way. (Fig. 5.)

While the newly-pared edges are still oozing, and before there is time for them to become glazed over with mucus, the sutures are introduced. Horsehair is used, and the sutures are passed about

FIG. 6.



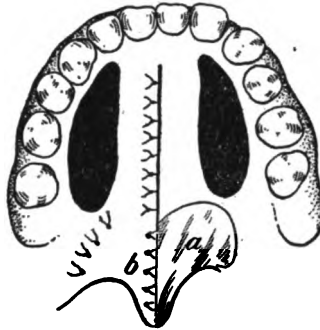
Showing sutures in anterior portion of cleft and outline for posterior flap.

one-eighth of an inch from the margin, and about a quarter of an inch apart, beginning at the anterior angle. When the required number of sutures have been passed they are tied, care being taken that the raw edges are carefully approximated, and that the stitches are not tied with too great tension.

A flap is now outlined upon the soft palate (see Fig. 6, *a*). If need be, one may encroach upon the cheek to make sure that there will be no tension upon this flap. This is dissected up, superficial to the tensor palati, making as it were a hinge at the free margin of the soft palate. An incision is then made along the free margin of the cleft on the opposite side (Fig. 6, *b*) and a flap is here undermined. Into this flap (Fig. 6, *c*), at its base, a suture is passed, carried over and through from the raw surface to

the mucous surface of the flap of the opposite side not far from its margin, back again through the second flap, and is brought out close to the point of entrance, thus completing a mattress suture. Two or three of such will be required, and these, when drawn up

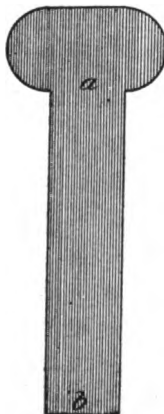
FIG. 7.



Showing sutures complete.

and tied, will bring the edge of the overturned flap well under the flap on the opposite side, opposing raw surface to raw surface. Two or three sutures are now passed as indicated at *b* in Fig. 7. In the same figure *a* represents raw surface left to granulate.

FIG. 8.

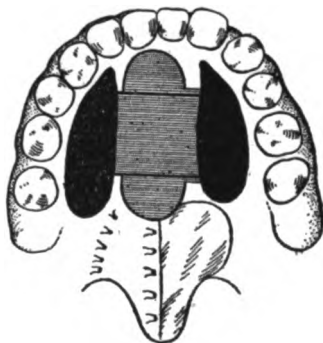


A piece of aluminum, gauge No. 36, is now selected and prepared as indicated in Fig. 8 with a flange at one end. At *a*, Fig. 8, this is bent at a right angle. The smaller end, *b*, is now

passed up through one lateral incision, then, by passing a pair of curved forceps into the opposite lateral incision, the free end is grasped and drawn down into the mouth again, until the angle *a*, Fig. 8, comes in contact with the newly-formed palate. The flange is still further bent over until it lies flat against the sutured margin (Fig. 9). The free end is then flattened over the top of the flange and the excess of aluminum is cut away, leaving about one quarter of an inch more than seems necessary. This free margin is now snipped in two places with a pair of scissors and each of the three pieces is carefully clamped with a pair of artery forceps over the edge of the first layer of aluminum.

The advantages of the aluminum seem to me to be threefold; it prevents tension upon the flaps, and also prevents—till union of

FIG. 9.



Aluminum strip in place.

the edges had occurred—adhesions between the mucoperiosteum and the bone of the hard palate. I am satisfied that scores of cases in which the Langenback operation, or some modification of it has been done, have gone bad because of union taking place rapidly between the mucoperiosteum and the hard palate, thus giving rise to tension on the flaps that was not present upon the completion of the operation. Then the aluminum plate prevents the child sucking the stitches, which I have no doubt is a very common cause of failure.

It has been urged as an objection to the aluminum splint that the food will collect under it, but to that objection I would reply, that as yet I have never seen such a thing occur.

The aluminum may be left in for 8 or 10 days, when it is



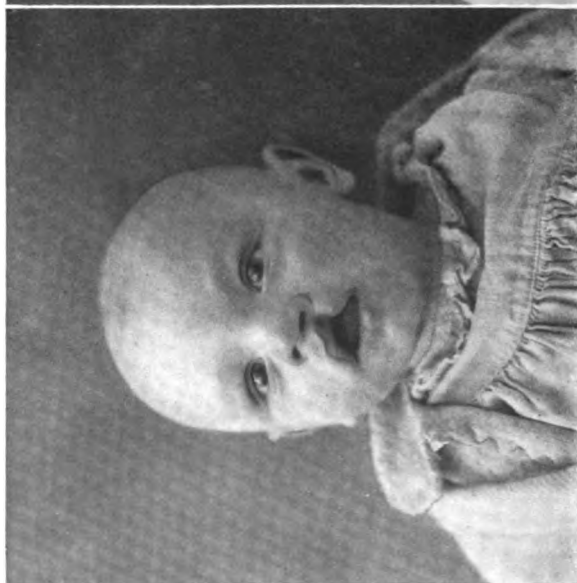
Before.



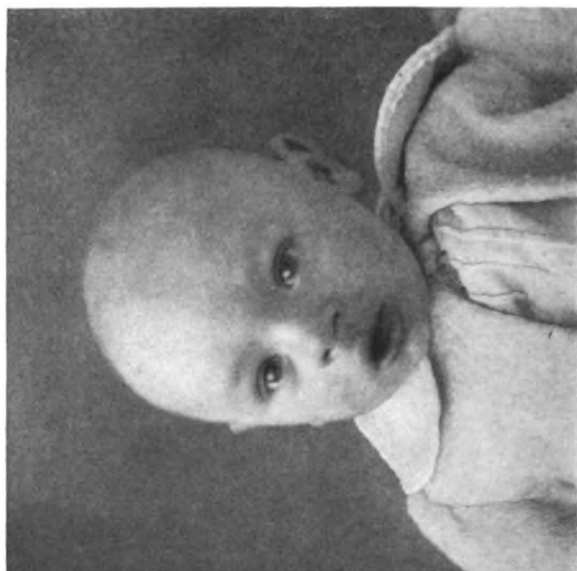
After.

Fig. 10.

FIG. 11.



Before.



After.

FIG. 12.



Before.



After.

easily removed by cutting it across with a pair of scissors curved on the edge, close to one lateral incision. These lateral openings rapidly granulate in and the patient is often able to leave the hospital, cured, in from ten days to two weeks after the operation. The child is fed regularly according to the requirements of its age. For nursing babies I have the nourishment dropped into the mouth by means of an eye dropper. During the process of healing the mouth is sprayed with a boracic solution containing 10 per cent. of alcohol, to ensure cleanliness.

In those cases in which the cleft extends through the alveolar margin, and in the case of double cleft, a flap may be turned up from the alveolar margin in the one, or from the back of the premaxilla in the other, and the lateral flaps sutured over the top, thus bringing raw surface to raw surface.

The operation up to this point has consumed from half an hour to an hour, and as the harelip can be completed in another ten or fifteen minutes, it is as well to complete the surgical procedure at the one sitting.

In my experience the secret of success in the repair of harelip is to make certain that there is no tension on the flaps, that horsehair is used as the suture material, and that no dressing is applied. If there is subsequent tension it matters not how accurately one gets the edges approximated, the sutures will cut out somewhere and leave an unsightly scar. If there is no tension the horsehair is quite sufficient to keep the parts together, and afterwards it leaves no sign of the unsightly suture scars that one so often sees in cases of repaired harelip. Under such circumstances the wound is certain to heal well, whereas if a dressing is applied it absorbs all the nasal discharge that may pour out, and sooner or later will lead to infection of the line of suture.

In approaching a case of harelip one should first evert the lips and then cut through the frenum close to the superior maxillary bone and as much of the mucous membrane as seems necessary. In cases where the nostril is flattened or deformed in any way the nostril and the surface of the face for some distance external to it, should be undermined. I often undermine up to the orbital margin to make sure of doing enough. If the case is one of double harelip, this is done on both sides. A few strands of gauze are

now packed up under the lip to check hemorrhage, and one approximates the uncut margins of the cleft in the lip to estimate the extent it may be necessary to denude the edges. It is very necessary to estimate carefully the amount of vermilion border available, and in most cases it is well to have the edges at the newly-formed junction pout a little to allow for the contraction of the scar. I have succeeded on more than one occasion in presenting the mother with a child with a veritable "Cupid's bow" of a mouth in exchange for the distressing monstrosity that came to the Children's Hospital. On several occasions mothers have been loath to believe that they were getting their own child back again.

Besides getting over all possibility of tension by undermining extensively, there is another advantage that I must mention, namely, the exudation that takes place in the face is sufficient to make the face absolutely rigid, so that if the child cries there is no movement whatever of the upper lip, and therefore, even if the child were to cry day and night, there would be no possibility of the lip being pulled apart.

In cases of double harelip with a projecting premaxilla, the lip should be freed from the premaxilla, and this bone used to fill in the space in the alveolar margin before the lip is dealt with. The small portion of skin attached to the premaxilla may then be utilized in the repair of the lip.

After operation it is well to keep the lower lip retracted and the lower jaw depressed for a few days by a piece of adhesive plaster, lest the child, accustomed to a large space for respiration, becomes suffocated before it has learned the use of its new nasal cavity.

It is well, too, after all such operations, to apply to the arms some light splint sufficient to prevent flexion of the elbow-joint and thus prevent the child's hands reaching the site of operation with perhaps disastrous results.

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MYOSITIS OSSIFICANS PROGRESSIVA

BY WARREN WALKER, M.D.

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Philadelphia, Pennsylvania

MILLIE R., seven years of age, born in Philadelphia, of Italian parents. Has three sisters and four brothers, all living and well. Father and mother living and well. No history of tuberculosis, syphilis or rheumatism in family, with the exception of an uncle who has rheumatism.

She has never had any diseases of childhood. At birth the child was perfectly formed except that the great toes, which bent outwards, were shorter than the second toes. No special attention was paid to this. The child has played about as every other youngster of her age would, until July, 1907, when she developed a stiff neck, which was treated with ordinary remedies without effect. In August a swelling was noticed in the right pectoral muscle, which was hard and painful to the touch. The skin over it of a dark red hue. Between August, 1907, and February, 1908, when I first saw her at the Children's Hospital dispensary, she had had several attacks of pain, swelling and redness in different locations on the back and upper extremities, each followed by exostoses or hardening of the muscles.

Examination, February, 1908. *Head.*—Normal, with no involvement of the temporal or masseter muscles.

Neck.—The first thing noticed is the marked prominence of the occipital tendon of the right trapezius muscle. It is very hard and stands out like a cord. The scaleni and sternocleidomastoids are also involved but not to such a degree as the trapezius. The head is fixed with chin pointing down, within two finger breadths of the sternum. Rotation of the head is not possible.

Back of Trunk.—Upon examination of the back one is struck by the exostoses. (Fig. 1.) The most prominent is at the lower angle of the left scapula. It is about one inch in height and one

half inch in width. A smaller one not quite so prominent is situated on the ninth rib, below the one described above. The left scapula can hardly be outlined owing to the marked induration of all the muscles about it. The condition of the right scapula is about the same; there are two exostoses below it, the larger being round and situated about one inch from the spine, the smaller above it and a little to the outer side. There are several exostoses on the eleventh and twelfth ribs on the left side, and several on the left side of the lumbar spine in the substance of the erector spinæ muscle. (See Fig. 2.) The spinal column is fixed and the child has great difficulty in picking up an object from the floor.

Upper Extremities.—I was struck by the lack of motion and the position in which the child holds her arms. They are held away from the sides in partial abduction, this being more marked in the left than right. Neither elbow can be brought in contact with the side. The left humerus is fixed, the only motion being that which the movement of the scapula allows, extension, abduction and adduction being impossible. (See Fig. 1.) On the shaft of the left humerus there is a pigeon-egg-sized bony mass at the inner border of the belly of the biceps muscle. The elbow can be flexed to a right angle, and can be fully extended. Motion of the right arm is limited; it cannot be fully abducted; extension to about 45 degrees. Flexion of elbow is possible to about 45 degrees. The loss of motion in the arms is due to bony masses in the axillary muscles. Palpation of the axilla shows bony masses in the anterior and posterior folds, those in the posterior fold being in the substance of the latissimus dorsi muscle. The X-ray shows that the bony masses in the left axilla apparently arise from the fourth rib and extend upwards and join the humerus in its upper one-third and in this way prevent motion in the left arm. Those in the right latissimus dorsi muscle have not united with the humerus, thus accounting for the freer motion on that side. (See Figs. 2 and 3.) The deltoids and biceps are not involved.

The Hands.—The fingers are all short, the little fingers being markedly so. No ankylosis or exostoses are noted.

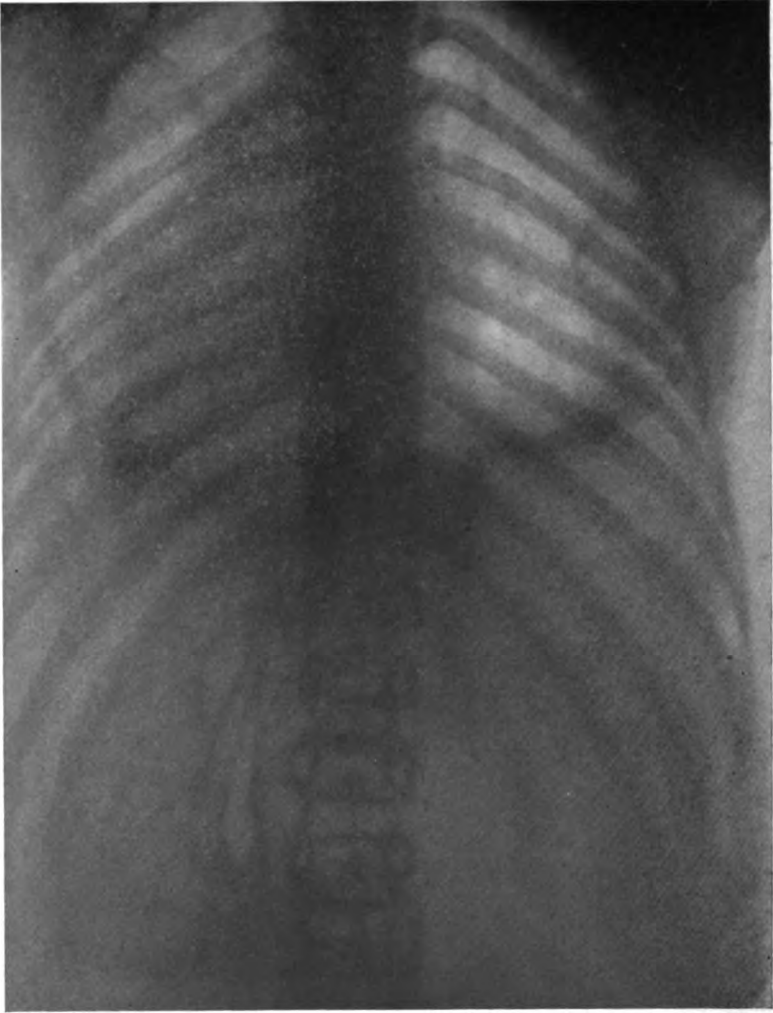
Anterior Aspect of Trunk.—The muscles of the right side are more indurated than those of the left. There are no bony masses found in their substance or on the ribs anteriorly. There is entire

Fig. 1.



Showing exostoses, and full amount of abduction.

FIG. 2.



**X-ray showing bony deposits in latissimus dorsi muscles and in erector
spinae of left side.**

FIG. 8.



X-ray bony deposits in substance of latissimus dorsi muscle.

FIG. 4.



Showing microdactyly.

FIG. 5.



X-ray of feet of child suffering from Myositis Ossificans showing microdactyly.

absence of respiratory motion in the chest, the breathing being entirely diaphragmatic. The abdominal muscles are not involved.

The Lower Extremities.—Walking not interfered with. No lesions of the muscles found. No exostoses found. The left thigh three-fourths of an inch larger than the right. Both great toes show microdactylia, being fully one-half inch shorter than the second toes. A condition of hullux valgus is present. The interphalangeal joint is ankylosed and the first metatarsal bone is short and stubby. (See X-ray and photo. Figs. 4 and 5.)

Myositis Ossificans Progressiva.—This condition which is a very rare one was first described by Freke in the Philosophical Transactions in 1740. It was described more thoroughly and given its present name by Munchmeyer in 1869. Since that time nothing has been added to his description, except the condition of microdactylia, which was pointed out by Helferich in 1870. This consists of a shortening of the thumb and great toes. It is due to a shortening of the metatarsal bone. Ankylosis between the two phalanges is very common, and before the days of X-ray the condition resulting from ankylosis was described as absence of one phalanx. The great toes point outward and in some cases there is a partial dislocation at the metatarsophalangeal articulation. This condition appears to be a congenital deficiency and bears out the theory that the disease is a congenital one depending on some congenital aberration of growth.

There are two forms of the disease: (1) Local or stationary form; (2) progressive form.

The progressive is distinguished from the local by the fact that it develops in youth, advances periodically and attacks many muscle groups.

The disease has been reported in nearly every country, but seems to be most commonly met with in America, England and Germany, fully 80 per cent. of the cases reported being from these three countries, only six having been reported from France.

Rolleston says that it is five times more frequent in boys than girls. Nové-Josserand states that three cases occur in girls to four in boys. It usually begins in the first ten years of life and progresses slowly with intervals of quiet, death occurring in ten or twelve years, either from some intercurrent disease, broncho-

pneumonia being especially common, or from inanition due to involvement of the masseter muscles.

The muscles of the hands, the feet, inner ear, diaphragm, sphincters, heart, tongue and genital organs are not attacked.

In a very complete paper by De Witt, in 1900, 78 cases of the progressive type are reported. Since that time I have found 13 cases reported as follows by: Comby and Davel, Ferranton, Graham, Menard and Tillaye, Micheli, Michelsohn, Nové-Josserand and Horand, Rager, Rivalta, Rolleston, Salvetti, Soncini, and Wilkinson. This case makes the fourteenth. In analyzing these I find that the disease occurred five times in boys to six in girls. Three cases I did not have access to. The average age was about six years, the youngest being two and a half and the oldest eighteen. This last is the age given at the time of the examination, for the age at the beginning of the disease was not given. Ten of the eleven cases showed microdactylia to be present.

There are three principal clinical facts which characterize myositis ossificans progressiva according to Menard and Tillaye.

- (1) Localized bony masses; (2) evolution by congestive eruptions; (3) existence of troubles of development.

Localized Bony Masses.—The localization is almost always the same, the trunk, the upper extremities, and the neck. In only one instance has a bony mass been discovered in the lower extremity.

Numerous muscles have been ossified in the upper extremity, but only in the arm and forearm; the hand has never been involved. The deltoid, biceps, brachialis anticus, the muscles inserted on the bicipital groove of the humerus and pectorals seem to be most involved. They are usually only partially ossified and chiefly at their upper insertion.

In the neck the muscles chiefly involved are the sternocleidomastoids, the scaleni, hyoids and upper fibres of the trapezius. The ossifications of the muscles of the neck have caused this disease to be mistaken for torticollis and suboccipital Pott's disease.

Of the face muscles the masseters are alone affected. When this occurs the prognosis is very grave as alimentation is interfered with.

In the great majority of cases at least one muscle of the back is involved, those usually involved being the latissimus dorsi, trapezius,

the rhomboids, serratus magnus, and the supra- and infraspinatus.

The evolution of myositis ossificans progressiva by congestive eruptions constitutes one of its principal characteristics. A child in perfect health develops in a localized area a cyanosed condition, the tissues in the area are of doughy consistency and painful. This inflammatory condition is absolutely local. There is no elevation of the general temperature. The digestive, pulmonary, circulatory and nervous systems are normal. These eruptions occur several times in the same location, the length of time between attacks varying. Each ensuing attack adds more to the induration of the muscle or muscles attacked. A muscle never becomes ossified without an attack of this sort.

The third clinical fact characterizing myositis ossificans progressiva consists in developmental troubles: Microdactylia of the hands and feet, ankylosis of the interphalangeal articulation of the great toe, absence of the first phalanx of the great toe, hallux valgus and malformations of the genital apparatus. These malformations have led certain authors to class myositis ossificans progressiva among the diseases of congenital origin; others have thought the disease might have an inflammatory, neoplastic or traumatic origin. It could hardly be of an inflammatory origin as the skin of the affected area is never red but more of a violet hue, and there is no fever, and the absence of those cardinal symptoms—redness and heat—eliminates the inflammatory origin.

Concerning the neoplastic origin myositis ossificans progressiva has been compared with multiple exostoses originating without pain or redness. In multiple exostoses, muscular troubles are not encountered, nor are there any arrests of development which are always present in myositis ossificans progressiva. In myositis ossificans progressiva the exostoses are always secondary to the ossifications of the muscles and moreover the exostoses of myositis ossificans progressiva are sometimes absorbed; this fact would be difficult to explain if it were a neoplasm.

As to the traumatic origin, the most that can be said for this is that it may be an adjunct, as it is wanting in a great majority of cases. Congenital syphilis has been thought by some to be a cause, but specific treatment has been given without any benefit.

The treatment of these cases has been very unsatisfactory, no remedy having been discovered which affords any relief, although a great many have been tried.

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Psychiatry

ON THE TRAIL OF THE SUBCONSCIOUS *

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THE pursuits of the physician and of the psychologist, primitively the same because neither had as yet come to his own, have in turn become divergent, at times distantly parallel, and more recently convergent to a common direction, united in sympathy of purpose. The bond of their kinship, and equally the source of their contention, is the attitude each is called upon to assume toward the evasive but persistent claims of consciousness,—at one period condescendingly recognized as a troublesome poor relation, at another welcomed as next of kin; now its legitimacy under vague suspicion, and again heralded as the foremost heir of the estate. Truly the vicissitudes of the family affairs of body and mind offer material for most interesting memoirs. Yet the branch of the house from which we of to-day claim descent, at least as a clan of prominence, is not a very ancient one. It dates, it is true, from the period of the intellectual conquest, when old knowledge was made new, and the revolution from the feudal systems of the mind had brought rapidly forward the vigorous advances of a fresh touch with nature. The understanding thus furthered remains the basis of an increasingly appreciative intercourse between the practitioner and the mental analyst, the latter now making his advances through the findings and the training of the laboratory, the former through a common diagnostic temperament alert to the subtle intrusions of a psychic complexity. Yet the present purpose does not demand a retrospective accounting. It assumes the less formal aspect of a visit from one branch of the family to another, the delegate

* Harvey lecture delivered February 8, 1908, before the New York Academy of Medicine.

encouraged by kindly invitation to recount some plain tales from the hills of his frequent sojourn, some comments upon the problems of his calling and their bearing upon the allied interests of his medical cousins.

The task which the psychologist assumes, not hastily but deliberately—while yet he appreciates the wise caution of the physician who fears to tread beyond the portals of a clinical experience—is to set forth the part of consciousness in the drama of life, the incidents and accidents of its career, and to essay some interpretation of its composite character. In this procedure he begins by noting how the functional utility of consciousness is guaranteed by its very establishment, and is step by step sanctioned by a progressive elaboration in the evolutionary series. I cannot doubt that I am more elaborately aware of myself and my world and more subtly reflective upon its revelations than is the dog who shares my hearth, however much the acuteness of his perceptions and the sober pursuit of his purposes excite my admiration. And if from my philosophic window I look out upon the laborer who with his companions is digging in the street and consider how much more complex are my mental processes than his, my complacency may find a check in the thought that possibly my gently bred companion in his own inarticulate impressionism may be indulging in equally impertinent appraisal of himself and the homeless cur outside. In both cases, the contrast judged by nature's catholic canons, is of a wholly subordinate import. What we share with one another in our common humanity is indefinitely more comprehensive than the deviations of our personalities; though it is just these secondary variations that for many of us constitute all that makes life worth while, and which very properly will loom large in later vistas of our excursions.

The utility of consciousness is readily appreciated. It is obvious that functions on the whole achieve the breadth and depth of awareness which their efficiency requires. The sweep and the brilliancy of the search-light of attention varies constantly with the voltage of the interest with which we keep alive the strands of our connections with the outer, and still more significantly, with the inner world. (Let me add parenthetically that it is mainly with the induced currents of the mental system that I am to deal.)

In healthy organisms attention goes where it is needed; and we go about our life's occupation, not with the meddlesome curiosity of busybodies, but with the poise and directness of thoughtful purpose. Circulation, respiration, secretion, and that troublesome and by no means always silent partner in the concern—digestion—pursue the even tenor of their several ways, while concordantly the delicate balance of tensions and impulses—embryonic and decadent metabolisms of the nervous traffic—is ever operative to shape the tone of our well-being, the temper of our moods, the profit of our central pursuit. Likewise it is well to remember that the mind as the body, though with a very different economy, has a normal temperature. We cannot maintain the red glow of the mental forge for more than brief periods, and only the more fortunately endowed in occasional moments reach the white heat of inspiration. For the most part an underglow of flickering combustion goes on with now and then a spark, and more frequently the peaceful embers of an unreplenished hearth. The normal mental temperature is compatible with, indeed requires, long periods of commonplace pulsations, not notably interesting, but natural withal. Likewise is it the case that much of this mental industry is of the nature of the idle singing of an empty day. When distinctive and imaginatively maintained upon somewhat higher than the ordinary level, we call it revery, or day-dreaming, or when vaguely shrouded in the forms of hope or longing and suffused with the privilege of the male sex, pipe dreams. Mental loafing it might well be called for plodder and genius alike. This normal gait of the dray-horse—and other's stables are full of them, however blue-ribboned the steeds that bear our livery—is a prosaic but important expression of the mental procedure. Much of the business of consciousness is lowly. The butcher and the baker, if no longer the candlestick-maker, set out upon their daily and necessary rounds. It is a monstrous perversion of that fitting Hellenic term to count as *psychic* only the accentuated or aberrant or startling productions of the mind's activity. We are all of us psychic through and through, even as we get up and as we lie down. Thoroughly if commonplacely is our living impregnated with all sorts and conditions of consciousness, bright and dull, deep and shallow, lofty and lowly, fluctuating ever but rarely quiescent.

Let this impressionistic sketch suffice to recall the comprehensive functions of consciousness in the human economy. But clearly also man was not meant to live by consciousness alone. Much of his activity is provided for by a foreseeing nature that guides his impulses encouragingly to their fulfillment, and leaves to his conscious self but the decisive direction of their maturing. And in large measure the genus homo follows in the footsteps of his preceptress and acquires a comprehensive and miscellaneous stock of second-nature habits, that mark the issues of his experience and education. Thus once more, he learns to conduct his mental affairs with much dependence upon personally trained subordinates and understudies, who enter upon their proper cues and take their parts unobtrusively, while the leading lady or the leading gentleman rises to the occasion—or to the gallery. Each one of us is not only a player and the world his stage, but a stock company with an extensive if not brilliant *répertoire*.

The course of events would move smoothly enough—and incidentally life would lose much of its charm as well as of its comedies and tragedies—were consciousness always wisely directed. “The ideal man” (I am indulging in the literary privilege of citing from my own pages) “might be said to have no forms of awareness but useful ones. But so long as it is human to err, the exhibition of various failings in the manner of our consciousness will remain characteristic of our psychological make-up. So long as the manner and degree of the conscious direction of our actions may vary, it follows that such direction may be wisely or unwisely, helpfully or disturbingly applied.” The natural history of consciousness is vastly enlarged by the inclusion of its pathological vicissitudes. Notably is this true of those subsidiary and suppressed participations of consciousness upon whose trail we are set. The false distribution of consciousness is most simply illustrated in such ordinary observations as the difficulty that besets many a person for whom a pill, not necessarily a bitter one, has been prescribed. When one tries to perform by intent and attention what is naturally a subconscious function, entanglement results. It is said that in China the swallowing test was used as an ordeal among suspects to reveal by the embarrassment of a subconscious function the perturbation of a guilty conscience. The test was quite as

likely to reveal the most nervously disposed individuals. An interesting illustration of the principle appears in the recognizable disparity between the stage cough or laugh and the same simple reactions performed in response to natural stimulation; or once more in the hollow cordiality that social custom entails, and the versatile mockeries of affectation. Insincerity to the discerning rings false. The counterfeit may approach the genuine with embarrassing resemblance; and yet the expert sensibility, sharpened by an intense interest in human character, suspects, examines and detects. What is pertinent is that the revelation of the disguise is frequently in terms of the failure of consciousness to manage what is by right or in part a subconscious affair.

The present purpose is predominantly a practical one: to present what the pragmatist terms an efficient conception of subconscious functioning, and to reach this end by way of a survey of mental abnormality through intrusion of subconscious activities. Thought reaches its distinctive phase by assumption of a logically directive purpose. Thinking readily assumes even in the thoughtful, the form of an effort, a task. Its more easy-going progress, as already indicated, is an idle musing, not a brisk and straight trot, but an easy stroll or ramble. The present thesis emphasizes that a release of guiding tension throws the mental movement back upon this logic-forsaking mood. Dreaming presents this relation; so do the lighter stages of anaesthesia (ether or nitrous oxide gas); so does the selective action of a psychic poison from alcohol to opium, to hasheesh, or mescal. The thought-movement of these states—provided that the mental wave is not sunk below reportable level—reflects the stuff that dreams are made of. It is by no means all chaos; much of it is in the nature of the communing of the private self, playful it may be and yet significant. Consider how utterly impossible it is to lay bare unreservedly the reflections, impulses and longings of even the purest and simplest soul. Now and then the sympathetic physician in the consulting confessional has revealed to him some glimpses of the inner life, usually closely screened, often unacknowledged or suppressed, at times entertained—angel and devil alike—unawares. And the very act of confession may purge the troubled soul by making explicit and accessible what was evasively taking shelter in subconscious retirement. An abso-

lutely, painfully faithful mental autobiography might well read like a "case" for the psychiatrist. Hence once more let it be noted that this sort of half-dramatic entertainment of suppressed and inchoate dream-stuff is present in great profusion, and may under release of tension, under marked stress, under hereditary flaw, press forward to disturbing, even to dominant expression; second that a vital factor in all work, all purposeful thought, all expression and significant behavior, certainly in all public appearance under the management of the social self, is direction, control, selection and repression, with the reins in the hands of the preferred self.

A corollary from this principle takes us directly to the hearth of the mental habitation, to that aspect or maturing product of consciousness, which we call self-consciousness. It reminds us that the self that we actually are is many-faced, showing one visage to the formal public, another to the professional colleagues, a third to the family intimates, and yet others at home and abroad, in mart and forum, in club or field. Biographers at times present as diverse views of the characters of their heroes as do artists of their outer lineaments; yet each may be truthful. We are not Jekylls and Hydes, nor even unduly *poseurs*; but our personalities are complex and versatile. The abandonment of long-sustained ideals, the release of struggle, or the stress of a primeval emergency loosens the veneer, even though it be both thick and adhesive, and reveals the plainer, more natural grain beneath. And at times what a welcome relief to don the negligée self, and within the privacy of four walls relax and yield to what we naturally are! The strenuous life is not a matter of brawn and bustle; the real strain is the mental one of striving for a part a little beyond attainment, of struggling ambition, and troubled unrest. And in the end, the self that he becomes when a man comes to his own, is a selective maturing, by successive shedding of shells outgrown, of the individuality chosen by combination of circumstance and endowment, from among the possible selves that he might have developed. Yet these suppressed potentialities are not altogether disowned and may yield evidence of a cloistered existence, by occasionally breaking through their wonted confines.

The next stage of the inquiry concerns the character of the growth and acquisitions of the self that is chosen from among the

many called. By what tokens is the legitimacy of the self's qualities and belongings recognized and acknowledged. There cluster about the full-fledged, personally conducted, psychic procedure three overlapping and interpenetrating qualities or privileges: for the first you are asked to accept the term incorporation. I incorporate into my personal experience in a sense everything to which I give attention, all that the attending ego accepts. I know of course that I do not respond to a small fraction of all the multitudinous sense-appeals that bombard my senses. To maintain any singleness of purpose in this tumultuous world my mind must turn its deaf ear to these distracting bids for attention, and be not at home to a further range of calls, pleasant and unpleasant. For the most part this is easy under normal health, freedom from care, and in customary surroundings, where only the unusual sounds an alarm. Moreover, I cultivate a concentrative power, enforced by a sense of duty, ambition, love of my work or what not; and this holds me to my task. But, assuming a lull in the day's occupation, I am fairly accessible to a varied range of claimants, but give to each no more than the nod of assent, the moment of recognition sufficient to its incorporation with the stream of my mental world. The bodily economy is insistent; and nature's cries in feelings of unease or ache or tension may well be, and usually are heeded. My routine is facilitated by well-organized habits; the shaping of the letters as I write is taken care of, while I devote my major attention to what I wish to say. All this is familiar and normal. But what happens when my incorporating privileges are curtailed, and how do they come to be curtailed? Here the subconscious enters; or rather it is present throughout, only a shifting of its mode of coming on seems to disclose it in a new and more striking rôle. Absent-mindedness is the popular and instructive index of the situation. I have been troubled all day because I have mislaid a bunch of keys. I know that I disposed of them but cannot recall place or occasion. I put them away while my more active attention was otherwise engaged, and the subconscious phase of my mental concern, that did the business, will not reveal to me where the keys are. I shall either find them by chance, or I may succeed eventually in tracking the trail of my subconscious understudy, who is a very near relative of mine and shares many of my habits. My friend

who in similar manner mislaid a notebook was very neatly furnished with the successful associative clue. The telephone bell rang; and instantly there came the conviction that yesterday a similar call was answered with notebook in hand, and that the book would be found, as it was, on the telephone shelf. Likewise have I friends who leave umbrellas on shop-counters, and when a subconscious impression nudges them and reminds them that a moment ago they were carrying something in the hand, they try but fail to recall what it may have been. And my friends have friends who actually walk home in the rain with an umbrella neatly rolled under the arm, while they berate their imprudence in not providing themselves with this useful but memory-taxing protection.

The symptom thus indicating a lapse of incorporation is properly termed an anæsthesia of a mental type. It is normal enough when applied to the lesser concerns of life and when easily corrected. It is abnormal when the lapse is persistent, or systematized, or peculiarly induced. The hysterical anæsthesias form the classical example, more convincing than any experiment the psychologist might arrange. A patient has an anæsthetic hand, whose welfare has vanished from the concern of her central self; you may pinch, burn or abuse this marooned member, and there is no pain or protest. Incredible as it seems at first blush, it is yet the fact that her abnormality has led her to neglect to incorporate that hand within the scope of her self feelings. What is central to our purpose is that some suppressed type of registry of the hand's experiences does take place, just as there is some latent impression of the mislaid notebook, or of the much desired umbrella. The sound of the telephone bell taps the subconscious source; and if I were to jostle the umbrella under the arm of the distract individual, he would instantly come to and recognize the situation and the umbrella. But the hysterical exclusion from consciousness is for the time persistent and abnormal; and I must have recourse to strategy to circumvent it. I pretend that I am a mind-reader, and ask the hysterical subject to think of a number, and while she is doing so, I tap seven times upon the anæsthetic hand. When I announce that she is thinking of the number seven, she is surprised at my expertness, and does not realize that the suggestion has come to her from a disowned subconscious source.

The hypnotic state similarly distorts the incorporative privilege; and at my bidding, the subject's hand becomes insensitive, or his eyes blind, and his ears deaf, to such selected areas of impression as I choose. Yet the unfelt touch is subconsciously registered; the sound is not wholly lost, the vision not wholly out of range. I circumvent the anaesthesia by artifice or by antagonistic suggestion, and obtain proof as before, of the suppressed incorporation. To illustrate: I arouse the hallucination that a lion, gentle and well-bred, is in the room. My subject sees the creature, describes its appearance and movements, adding a gratuitous touch or two from his own fancy, and as usual upon awakening disclaims all knowledge of the adventure. But before restoring him to normal consciousness, I have implanted in his mind the suggestion that if, (when he comes to) the wedding-march is heard, he will see something unusual when he gazes into a glass of water. Presently by arrangement the familiar strain is sounded, and he describes the reflection of a lion in the mirrored surface. Or if my subject is equal thereto, I ask him when awake to draw any animal he chooses; and unsuspectingly he draws a lion. Yet again: I impose not an hallucination but a mental anaesthesia. I cause him to be blind to the letter a, and thereby reduce such a phrase as "alabaster from Madagascar" to an unpronounceable jumble of consonants. Yet obviously he must see the "a's" to avoid pronouncing or writing just this specified and no other element of the alphabet. In all this the hypnotic assimilation is conditioned by the channels of my suggestion, thereby indicating in what manner the incorporation is handicapped; while its paradoxical mode of revealing what the normal consciousness claims not to know,—not wholly unlike the status of my lady who in "cutting" a too presuming acquaintance describes the variety of discomfiture exhibited by the person whom she did not see—is typical of the abnormal mode of participation in the subconscious registry.

Orientation is the second and essential aspect of the developed psychic procedure. It presents the psychological book-mark whereby we note the successive moments of life's unfoldment. Its service is concretely illustrated in the coming to after the minute's loss of consciousness under nitrous oxide gas, when articulately or by expression the patient asks, "Where am I?" It is quite

as explicit in the recall of the hypnotized subject from the realm of bizarre suggestion to actuality, or in the sudden awakening from dreamland to the same old world, which is the normal clearing-house through which we certify the validity of the psychological currency. Not only is there orientation to the familiar landmarks of our environment, but to the still more familiar set of feelings that compose so evasively the essence of our personality. One phase of my activity ever keeps tab of time and situation and reminds me at intervals that I must not write too long; for I have a class to enlighten later in the morning. Likewise a summons from that insistent discourager of leisure—the telephone—may unpleasantly break through my absorption. Or again, I may lose myself at the theatre and realize only the stage and the predicament of the hero: while the fall of the curtain shuts off the one and sends me back to the other world. Yet my suburbanite neighbor was fidgety at the very climax because his subconscious mentor kept nagging him to be sure not to miss the 11:10.

The specific product of a disturbed orientation is an hallucination. The dream so long as I sleep is to me the keenest reality; for I have wholly forsaken allegiance to the world in which I pay my bills, to its obligations, to its physics and biology and psychology. I fly, and am ten feet tall, and see through stone walls, and peer through mysteries by the exercise of powers compared to which telepathy is as simple as looking up the answers in the book. Yet some allegiance to a logic-bound cosmos remains, and fitfully or persistently asserts itself. All this seems normal enough; it is not so much the forsaken as it is the handicapped or wrecked orientation that makes the impression of the abnormal. The hypnotized subject maintains some sort of orientation towards the objects about him; but the interpretation thereof is distorted by my suggestions. He accepts my fountain pen as a stiletto and the upholstered chair as his kneeling victim. Or, if I choose, I summon equally well out of thin air fictitious appearances whose invisible form he sees with his mind's eye, whose voices he hears and whose messages he interprets according to my suggestions so far as I intrude them, by his own endowment and training for the rest. Yet, as before, I can secure evidence that some phase of his handicapped mentality recognizes the artifice of the situation. Similarly

the hysterically constructed world presents hallucinations that border puzzlingly upon fabrication, because the orientation is so subtly impaired. The trance state is variable by reason of just this fluctuation in the loss of orientation. It is entered as a rule, just as we invite sleep, by a consenting direction of the mind; and the pronouncements of those who enter this state for the purpose of impressing their friends or clients with the strangeness of their powers, disclose a partial orientation to the surroundings, and in some measure a draught upon mental resources that do not yield to direct voluntary appeal. Many of the mistakes of the older students of hypnotic phenomena were due to their failure to recognize that their subjects maintained a *partial* orientation to their environment, and from what they heard or saw, derived suggestions which they elaborated to make the results accord with the expectations of the experimenters.

It is the distinction that we are now drawing that offers the popular line of demarcation between sanity and insanity. Unless I can hold apart the world of fancy from the world of fact, unless I distinguish between what I have dreamed or romanced and what I have experienced, I cannot square my doings with those of others or with the great world without. It is just because these obligations are so slightly treated by the eccentric and the inhabitants of the psychopathic borderland that we find amongst them such glorious liars. We conclude that hallucinations are of all sorts and degrees of reality and unreality, because they play in and out of the subjective and the objective world; and they are such in part by reason of a subtly subconscious prompting of the hallucination, and again by virtue of a subconscious recognition of the fiction. We observe likewise that something like this is what is meant by liability to suggestion, a tendency to forsake the critical tests of reality, to fall back to a curtailed privilege of orientation. The process fortunately works both ways; and in many cases—as the psychic treatment of mental disorder shows—we can suggest patients out of their perversities as effectively as their aberrations suggest them into the abnormal attitude.

The third and consummating privilege of a rounded psychological status is initiative. The sense of initiative appears with the feeling of intention, the merging of deliberation into impulse, and

the passage of impulse into performance. The feeling is rendered more vivid by the presence of obstacle or difficulty. When things sail along smoothly and fluently and production is easy, the sense of initiative is lightened. Relieve it still more by an unusually happy support of the associative mechanism, and one may pass to the feeling of its entire abeyance—an impression illusory in fact though convincing to the subject thereof—as though the result were produced by an extraneous agency, or in the loftier formulation, by gift of the muses. The factor of initiative is somewhat complex; and if you will pardon a brief lapse into the *ex cathedra* habits enforced by a score of years, let me set forth that it presents a “firstly” and a “secondly,”—an awareness connected with the accumulation and escape of the puff of mental energy necessary to the performance, and then a return message from the muscles to the effect that the deed is done. Impairment of initiative is accordingly of several types, and at the briefest—all still within the normal range—(1) a lapse of outgoing awareness, so that we do things without knowing it but are aroused to the consciousness of the action performed through the aforesaid return sensations; (2) the presence of the feeling of preparatory initiative, but a consequent falling out of mind of the return report; and (3) the running through of the entire procedure without arousing awareness at either end. Moreover, the formula must be modified to include the more subtle aspects of mental effort, the inner conflict with but slight motor issue; for throughout must we bear in mind that repression is just as typically action as positive performance; that conflict of impulses, the holding down of native tendencies and all that is meant by inhibition, is as elaborately and effectively provided for in the nervous system, as is the more direct translation of impulse into action.

To continue in the pedagogic vein, I add an illustration or two: The following occurrences are about equally frequent: I enter the house at evening,—my mind I know not upon what business of its own,—and am recalled to the status quo by the click of the night latch which I have set wholly without intending to do so, for this evening it is to be kept free for a late arrival. My habits have taken it upon themselves to attend to this bit of business through suggestion of hour or occasion, just as they often needlessly

wind my watch when I change my waistcoat. Type number three of lapse is presented by the occasion upon which I descend to set the night-latch, and find I have already done so, doubtless in an absorbed moment, but consciously have no record thereof. The intermediate situation may result in my forgetting to set the latch altogether; so clear was the intention to do so, that the act seems complete without a record of its fulfillment; or again I may be in doubt whether the latch was set or not (though if set, it was intentionally set) and find about equally often that the second mission was a necessary or a useless one. All these several modes of normal lapse have their counterparts in abnormal situations, both being comprehensible in terms of subconscious expansion or usurpation of function.

It is because action consummates the psychic wave that its impairment forms at once the outer index and the inner clue to the difficulty. The most readily formulated situation is the extinction of the guiding initiative. Normally this is possible only for brief periods, for the reason that whatever else I relinquish to subconscious support, I must guide conduct or the movement will cease, at all events cease to go forward or in the desired path. If I yield a little, my mind begins to wander, and my work stops. My subconscious habits will carry me only over this and that familiar gap, once I am well under way. But to work, I must keep my energy going, my thoughts active, my expression ready, in order that my writing continue. But abnormally there occurs what is known as automatic writing. While the hand writes, a fair measure of orientation may be maintained. The subject may talk with you and yet continue writing; or it may be that he is but partially accessible to sensory appeal. He has the feeling that some extraneous force is guiding the pen, that the thoughts are not of his furnishing, the composition not his creation. This abeyance of the feeling of initiative leads to various assumptions. It presents itself as the feeling of inspiration, the attitude of dictation to the words of the muse or of a spirit, or in the religious moods, of God himself. It is very strikingly present in the anæsthesia of ether, and has been termed the anæsthetic revelation. The patient has the feeling that all mystery stands revealed to a liberated insight. To Sir William Ramsay it came thus: "An overwhelming impression

fixed itself upon me that the state in which I then was was reality; that now I had reached the true secret of the universe in understanding the secret of my own mind." To Mr. J. A. Symonds in these words: "My whole consciousness seemed brought onto one point of absolute conviction; the independence of my mind from my body was proved by the phenomena of this acute sensibility to spiritual facts, this utter deadness of the senses." To Professor James still more explicitly: "Truth lies open to the view in depth beneath depth of almost blinding evidence. The mind sees all the relations of being with an apparent subtlety and instantaneity to which the normal consciousness offers no parallel." To Dr. Holmes likewise: "The veil of eternity was lifted. The one great truth, that which underlies all human experience and is the key to all the mysteries that philosophy has sought in vain to solve, flashed upon me in a sudden revelation. . . . As my natural condition returned, I remembered my resolution, and staggering to my desk I wrote in ill-shaped, straggling characters, the all-embracing truth still glimmering in my consciousness. The words were these (children may smile; the wise will ponder): 'A strong smell of turpentine prevails throughout.'" Doubtless the incongruity between the impression and the reality is no greater in the last instance than in the others; and as Dr. Holmes bids us ponder, let us note that the fact recorded indicates some measure of orientation to the forsaken world of sensory experience—an instructive factor in other records—and again, that the very absence of obstruction, of thwart, or hindrance, induces the feeling of revelation, suggests in fact in the philosophically disposed, abeyance of mental effort, the dissipation of initiative. In the less deep invasions of the self-feelings, it is easier to trace allegiance to the experiences of the normal self; and the source of the knowledge revealed in most automatic writing is quite plainly that of the waking self. Here all depends upon the depth of the fissure that has arisen and the degree of purposive activity that may be maintained, while yet incorporation, orientation and initiative are handicapped. For such a state the word "dissociation" is peculiarly apt,—a term that will find explication as we proceed.

One may summarize at this stage that a typical result of impairment of initiative is impulsions. The subject is impelled in hypno-

sis or again in the intrusions of hysteria (all of which in turn have an analogy of status though possibly not of origin with the irresponsible impulses of pronounced insanity) to carry out an action, even though so much of his normal character as remains, struggles against it as needless, irrational, wrong, or unseemly. Such an individual retains an awareness that the act is going on, that it is his act, and that accordingly he may or must invent some show of reason to make it seem plausible. In brief, so long as he is in the hypnotic condition that condition accepts the act as its own, for in that phase of consciousness the act arouses a feeling of initiative. Upon awakening, his alert fully privileged consciousness takes up the trail where it was relinquished to the handicapped self, and may know nothing of the other action whatever. We conclude that so long as we find actions going on within us with a feeling of initiative, we acknowledge them as our own, being ignorant that the act has been imposed by an extraneous suggestion. Such is the state of hypnosis directly, such is indirectly the state of natural somnambulism, and such with subtle and puzzling variations is the hysterical state. In contrast with these stands the trance states, the intoxication of drugs, the lighter stages of anæsthesia. Here the feeling of initiative slips away through loss of the sense of effort, and what the subject finds expressed by or through his organism he attributes to some external agency. Yet both are instances of handicapped or distorted initiative.

Anæsthesia, hallucination and impulsion thus become the more typical issues of handicapped privileges of a rounded psychic movement; and it is pertinent to inquire what it is that prevents the appearance of these mental distortions in the normal state. Preparatory thereto may we also ask what then is the normal state?

It is perhaps intelligible why we have no special term for this routine, distinctive, non-being just mentally alive. We feebly call it the waking state opposing it properly enough to dreaming, yet realizing how inadequately this describes it. I came upon a friend the other day standing at the door of his house and asked him what he was doing. He replied, "Waiting for the postman." What an incongruous description for an occupation. What he really was busy with mentally, to feed his mind while waiting, may have been some philological speculation (for such is his calling)

or in watching aimlessly the iceboats scurrying across the lake, or in reflecting upon his sins, or his debts, or engagements. The sudden and magnanimous offer of "A penny for your thoughts" takes many of us unawares; but we rarely catch the stream whose current we are asked to tell. Well, that is the normal and yet most fluctuating state from which we measure departures. And what is most distinctive about it is just this assertive, taking in charge, personally conducted, bossing-the-job attitude which I have asked you to call initiative. Accordingly if you tell me that there is a lion in the room, or that the fountain pen is a stiletto, I laugh at you. My mental alertness tells me otherwise. You cannot arouse an hallucination, because my critical faculties are awake to the actual and reject all that does not square with it as unreal. Similarly you cannot create, nor can there spontaneously arise any large areas of mental anæsthesia. The very implication of this normal wakefulness is that I am awake to a comprehensive range of appeal. You may pick my pocket when I am falling into a doze, or when I am absorbed in the shop windows—for the loss of orientation on the one hand, and the narrow concentration on the other contract my incorporation. But you would have to be very expert in your craft to ply your trade while I am particularly and objectively alert.

Similarly in regard to impulsions. I may find myself momentarily beset by an irrational impulse; but it does not reach my muscles because I check it, or my ingrained habits check it for me. And so again if you wish to train me in automatic writing and ask me to let my hand rest and care no more about it, I cannot comply. The hand is too much mine; I cannot disown it; and I cannot do it, because I am normal, because my incorporation and initiative include all that happens to the hand. The automatic writer has the knack of the nervous system that permits him to do what I cannot. Supposing once more, that an impulse arises in me, I may state again that the reason why it does not reach expression is that all the avenues of expression are already absorbed and taken possession of by the expression of my voluntary conduct. We have only one muscular system; and that has been made available—every organized bit of it—to the expressions of the normal consciousness. In this fact lies the essence of a unitary, consistent

developed self. So it results that when this hypothetical impulse arises, it must do one of two things; it must oust the pilot or drug him or in some way incapacitate him, and get possession of the whole mechanism and use so much of it for the expression of its purposes as it requires; or it must disengage a part of the motor mechanism of expression and utilize that without arousing the suspicion of the theft. The last is the ordinary status of automatic writing; the former takes place in hypnosis, and more interestingly in alternations of personality and similar dissociations.

At some stage of my presentation a brief digression is necessary to enable me to pick up some loose threads and weave them into the main strand of my discourse. I might have emphasized at each stage of my story that the most distinctive factor of abnormality is temperament. We all have experienced the lapses of absent-mindedness; but the extreme instances occur in those by temperament distraught, disposed thereto by some inner, natural trick of their brain functioning. The tendency to enter the hypnotic state is similarly conditioned. Hysteria is but an exaggeration of temperament. The ability to enter the trance state, to write automatically, are all similarly significant. The student of mental abnormality cannot create his material but must study it as he finds it; and he comes to know where to suspect its presence by becoming keen in the detection of outer revelations of temperament. He does this at least in so far as he develops a clinical aptitude in his chosen career. Let us note then that as we transfer attention to the more abnormal and unusual aspects of dissociated conduct, of handicapped mental procedure, we are entering the field within which temperament is dominant. It is no longer possible to describe types, but only individual cases.

I likewise have been waiting for an opportunity to insist that a phase of our personality as vital as any, stands in contrast to what I have been in the main describing, while yet it coöperates with it; to indicate that much of the mental procedure is not thought or action but feeling; that to understand mental normality and abnormality alike, we must enter intimately and sympathetically into the world of the emotions. These motivate conduct, stimulate and supply the thought-progression, permeate every avenue of the mind's approach, and cluster with peculiar tenacity about the

central, personal self, with all its liability to barometric changes of esteem and disparagement. Every phase of our exposition could have been shaped to embody an emotional or an emotionally tinged experience as clearly as an intellectual one. Particularly is this aspect of the mental life important for the clue to abnormality and the intrusion of the derivative and supporting aspects of mental progress.

With these obligations suggested if not met, I reach the specific goal of my essay, the formulation of subconscious functioning in its abnormal embodiment. Believing as I do in the illuminating power of clinical experience, I must dwell yet a while longer in the descriptive field. The realm to be entered is an attractive one, that of handicapped, altered, distorted and divided personality. Concordantly with our previous analyses, such lapse will reveal itself in the mode of behavior of the incorporative, orientating and initiative privileges. The curtailment will be more comprehensive, more variable, more pervasive. Equally will it vary in depth as well as in breadth and contour; and yet again in one further aspect very important to the clinical comprehension, the mode of onset or origin. I shall begin with the matter of depth. The lighter invasions of the personal integrity will be in the nature of semi-objective projection, of romancing,—forfeiting some privileges of orientation but maintaining the scene of the invasion free from encroachment upon the practical life, the every-day vicissitudes of conduct. It is these that blossom profusely under the emotional incentive of adolescent perturbation. It is not accidental that cases of wayward personality occur typically in young women of unstable, possibly hysterical temperament, as abnormalities of the maturing of the adult self. The abnormal culture then finds a favorable soil for its nurture. The dramatic romancing of this period gives it encouragement, and like much else, it grows by what it feeds upon.

I cite because of its accessibility, a case not difficult to parallel in less developed form—that of Mlle. Hélène Smith. This young woman of bourgeois origin and amid commonplace surroundings was given to day-dreaming, the theme ever centring about the unusualness of her own personality and its probable destiny. Her real self—not the one that served as clerk in a shop at Geneva—she regards as endowed with peculiar sensibilities, and in subcon-

scious reservation elaborates for this alter ego a somewhat systematic idealization. This passive indulgence—which under the stress of a practical busy life might well have dropped its petals and blossomed unseen—was revived into artificial expansion by the discovery within herself of the power of automatic writing, and by the significance attached to her utterances by her spiritualistic-minded friends. Thus encouraged, she began to give séances after the manner of converts to this modern form of an ancient belief, and to develop in her trances a series of dramas with successive change of rôle.

I must confine myself to the most bizarre of the three dramatic sequences that constituted her trilogy. The scene secures freedom from the impertinent restrictions of reality, by being laid upon Mars; and subsequently the stage setting is elaborated, being provided with a flora and fauna exotic and distorted, somewhat after the manner of Lear's nonsense botany, with a recognizable blend of the oriental. It is all juvenile in conception and is in its detail quite insignificant. More significant is the development under the same set of motives of a Martian language, quite consistently carried out, and in fullness of time yielding a characteristic alphabet, a simple syntax and a creditable vocabulary. The messages thus revealed are in the nature of fulfillment of suggestions implanted by intent or by implication by her interested clientèle, and when not thus specifically occupied embroider a tale in which the leading lady—alias Mlle. Smith—finds a stage and an audience for what was previously composed in the underground workshop of her ruminations. From an intellectual point of view the most substantial achievement is this invention and retention of an artificial jargon with its strange alphabetical symbolism; and characteristically let it be noted that it was just this feat that required longest incubation and presented itself in successive steps: first a few sporadic utterances in the unknown tongue, then a gradual accumulation of vocabulary, with a few simple syntactical complications; lastly a few words in strange character, and even at the end never fluently written, always clearly suggestive of a slow and careful ripening. For the other dramatic episodes—the one Persian in setting, of mediæval character, and the other bringing forward the rôle of Marie Antoinette, I must refer to the protocol, calling atten-

tion only to the fact that these feminine fancies provide a more personal and engaging part for the leading lady.

What interests us notably is in the first place how all these revelations, writ in the sympathetic ink of a luxuriant fancy, reached decipherment; and again what is the relation of the output to the work-a-day self of Mlle. Smith. Fortunately and characteristically this sleight-of-mind brings its own transmuting formula with it. For the utterances and writings and promptings objectified with a weakened sense of initiative, an alien personality is held responsible. This in the unwarranted and yet not inapt phrase of the spiritualists is called a control. Airy figments are satisfactory to no one; and abstract conceptions to psychologists alone; the local habitation and the name is indispensable as a lay figure at the slightest, as a complex, if fictitious, personality at the best, upon which the embroidered products of the mental loom may be draped and combined to artistic effect. This guardian of Mlle. Smith's inner life is called "Leopold." He guides her hand, interprets the messages—first by a simple "yes" or "no," later by writing and inspired utterance. Leopold is a somewhat shady character (who with equal propriety might have been called by his intimate friends "candle ends," by his enemies "toasted cheese") and is psychologically the measure of overlapping of the directive and the subconsciously elaborated self, who alone—in one stage at least—possesses and manipulates Mlle. Smith's organs of motor expression, and unfolds the secret of her mental incubation. Now, objectively we are not surprised to learn that the language spoken on Mars, while uncouth in sound, has a notably French syntax, French being the only language that the subconscious and the conscious linguist in this case knows; that some of the incidents woven into the *mise-en-scène* are of bookish origin, others transformations of pictorial suggestion, and the stray impressions of a sensitive observation; while still others—as is natural—defy the attempt to trace them to some assignable provenance. Finally and most essentially are we interested to know how *real* is the invasion of this trance production; how intimately she is rather than *acts* the rôle of her trance personalities. The evidence is quite clear. The invasion is for the most part light. The shop clerk is but very rarely and only in the most mature stages of the evolution troubled by any hallucinations,

or anæsthesias or impulsions. Once she sees Leopold's face or a Martian picture, or has a presentiment which causes her on the streets of Geneva to choose a circuitous path to her home, or to remember by subconscious impression some detail of her business. As you see, Leopold and the rest of her subconscious troop know their places and do not emerge from the stage entrance and appear in masquerade upon the highways of her practical life. And likewise within the trance she retains some incorporative and orientative power. When as Marie Antoinette she smokes a cigarette and the bystanders comment upon the historical incongruity, the offense is never repeated, though the banquet of which Marie Antoinette partakes in robust appetite makes no impression of satiety upon Mlle. Smith when she awakens to the sight of a scattered feast; and though again, her comrades of the banquet are no longer for her plain citizens of Geneva but lords and ladies of the French court. Thus, the interpretation however fragmentary, is really consistent; and the incidents when stripped of their adventitious detail reveal a plot which the psychologist may with some satisfaction set forth.

I must pass at once, and I fear with still more ruthless curtailment to the complementary type of drastically real invasion of a wayward personality of similar adolescent origin, but grafted upon a far more abnormal and hysterical temperament: I refer to the well known case of Miss Beauchamp, so graphically biographed by Dr. Prince. Displaying the usual impressionable day-dreaming indulgences of adolescence, strongly tinged with the emotional personal centring, to her the world in which she lived was but little more than a filmy screen against which the transposed figments of fertile fancy were realistically projected. Yet combined with this there was exercised a rigid control of these complex impulses, sufficient to conceal from her friends the troubled nature of her mental intrusions. Thus, a college student at the age of 23, nervous and erratic but in good standing and well liked by her friends, she came under professional observation, and in Dr. Prince's words pertinent to the period of her greatest personal instability: "she may change her personality from time to time, often from hour to hour, and with each change her character becomes transformed and her memories altered. In addition to the Real, Original or Normal

Self, she may be any one of three different persons. I say three different persons because, although making use of the same body, each, nevertheless, has a distinctly different character; a difference manifested by different trains of thoughts, by different views, beliefs, ideals and temperaments, and by different acquisitions, tastes, habits, experiences, and memories. . . . Two of these personalities have no knowledge of each other or of the third, excepting such information as may be obtained by inference or second hand, so that in the memory of each of these two there are blanks which correspond to the time when the others are in the flesh. Of a sudden one or the other awakes up to find herself, she knows not where, and ignorant of what she has said or done the moment before. Only one of the three has a knowledge of the lives of the others, and this one presents such a bizarre character, that the transformation from one of the other personalities to herself is one of the most striking and dramatic features of the case."

In this troublesome tale we have the deepest invasion of the self's integrity; and hallucinations, anæsthesias, and impulsions beset the rounds of daily life and rob it of all possibility of peace or consistent maturing. The endless strife, compromise, victory and despair, strategy and counter-strategy of this tragic conflict I cannot stop to recount, nor can I suggest the therapeutic measures used with endless patience and discernment to bring about a gradual dominance of the normal personality and the restoration to a fair degree of mental health. I must confine my interpretation to incidents that illuminate the relations of the struggling selves in terms of our accepted analyses. This brings upon the scene one "Sally" who in the drama which Dr. Prince was tempted to entitle "The Saint, the Woman and the Devil" may be said to be the incarnation of the party of the third part.

Sally's disposition and the delight she took in tormenting her other self will be sufficiently evident in an incident or two: "Miss B. who had an abhorrence of insects and reptiles, found a box neatly wrapped, from which, as she opened it, six spiders ran out. Sally who claimed to be subconsciously present to witness the effect of her practical joke, thus describes the incident: 'She screamed when she opened the box, and they ran out all over the room.'"

Sally, who felt no pain or fatigue, would walk to a suburban town where she would wake herself up as Miss B. "who, utterly stranded and without money in her pocket, was obliged to make the journey back on foot arriving utterly exhausted." Or again Sally would entangle the worsted yarn of the fancy work that engaged Miss B.'s leisure, wind the threads from picture to chair and around her person, finally hiding the ends in the bed. "Then Sally, standing in the midst of this perfect tangle of yarn, wakened Miss Beauchamp who came to herself in the maze."

With such a preamble, one is not astonished to learn that when Miss B. was preparing to go to Europe, Sally should actually assume the character of her double and only by chance was she frustrated from sending off upon the foreign tour not Miss B. but her counterfeit—all this of course at a later and more nearly convalescent stage of the case. Nor must I wholly omit the true complexity of this situation by failing at least to cite the fact that even the Miss B., the college student who presented herself for treatment was not the whole or, if you will, not the core of Miss B., the normal personality inherent in the individual towards which, we may assume, a Miss B. of more fortunate temperament would have tended. There is then a third state and in some sense a variant of that; and this fourth variant state proved to be a clearing house through which the obligations of the militant or rival operations could be discharged, the one declared insolvent, and the receivership arranged and authorized for the new unified and reorganized firm. What I have most in view is to utilize this complex situation to illustrate further and in richer coloratura the subconscious relationships and vagaries. To bring forward the most salient instance first, let me show that what Miss B. does in a moment of abstraction in the subconscious range of her activity is just that of which the subconsciously dominant phase of her being—in this case Sally—is cognizant. Accordingly when Sally appears, she can exercise this peculiar power and relate an incident like this: "She yesterday received a letter from a photographer. She had it in her hand while walking down Washington Street, and then put it in her pocket (side pocket of coat) where she kept her watch and money (banknotes). As She walked along, She took out the money and tore it to pieces, thinking it was the letter from the photog-

rapher. She threw the money into the street as she said to herself 'I wish they would not write on this bond paper.' Possibly the last detail is an explanatory concession from the then dominant personality to its rival, to prevent the latter from breaking through and securing an awareness of the disaster. Still further corroborative is the fact that Miss B. (without losing that phase of her identity) may be thrown into a trance-like condition in which she sees as if reflected in a shining surface, some of the incidents dominated by the "Sally" personality; and in such a vision she actually saw herself walking down the street tearing up green pieces of paper and putting the letter into her pocket.

Still more remarkable and equally corroborative of the status here assigned to these actions is an instance of anæsthesia, peculiar because with both phases of consciousness available as witnesses we obtain an illumination of the shield from both the golden and the silver side. While fingering a chain upon which some rings were strung the chain parted, resulting in the loss of some of the rings. The other Miss B. became convinced that all the rings were lost, and "Sally" tried to persuade her otherwise. "I have put them on her finger," says Sally, "but she won't see them, Dr. Prince; and I have taken her hand and made her take hold of the rings, but she won't feel them." Similarly when Dr. Prince awakened her in the other personality, he could click the two rings together, or pull her head by the chain to which the rings were attached about her neck, without breaking through the anæsthesia. The possibility of one phase of consciousness thus corroborating the anæsthesia of the other suggests an advanced phase of the dissociation, and may in itself be suggestive of an *rapprochement* of the two activities.¹

These incidents must suffice to illustrate how difficult may become the intercourse of a divided personality, and yet that such complexity is but the issue of the same order of dissociation which

¹ It is well in dismissing this case to record that it is extremely difficult to avoid in such dissociations the creation of an artificial or suggested relation, and again of provoking the very phenomena that are regarded as spontaneous. While such a product approaches simulation and deception, such terms require considerable toning to adapt their usual implications to the abnormal status. The ultimate criterion is the confidence in the discernment of the professional student of the case.

in its simpler formulæ yields concrete and intelligible values. What is most startling is that out of such disorder rival personalities and not merely interruptions of normal states should result. We do not speak of our dream selves but of our dream states, accepting these gaps and transformations as normal incidents of the mind's vicissitudes. It is obvious that such dream states are sporadic, do not synthesize, do not accumulate experiences connected with the self feelings, and incorporated with a memory sequence, and motivated by desires, and distinctively achieving the control of a motor mechanism for their expression. This truly constitutes the *leit motif* of these dramas, and though another story is built upon the same lines of composition.

An equally pertinent yet distinct set of episodes emerges when we consider not the upbuilding but the dethronement of a self already established; and yet another when we consider mixed cases in which the very disintegration is conditioned upon a natural disposition to aberration of this type. Most worthy of citation in this instance is the case of the Rev. Mr. Hanna, though it must be said at once that cases in this realm are not typical but individual. What alone I shall have time to emphasize is the fact that after a sudden incapacitating fall a bereft personality awoke, ignorant of all the vicissitudes of a varied and mature life, shorn of all possessions even to the recognition of the commonest objects and their uses; that then there intervened a period of slow reinstatement of function, in the latter stages reinforced by direct and vigorous stimulation; and that finally the older and mature personality reappeared at first fitfully and then more stably, until in the end a fusion of the reacquired and the original personalities took place with a consequent restoration to normal health. The peculiar value of this case is that during the periods of alternation of the bereft and the original Mr. Hanna, there came to exist just that relation of dominant to suppressed realm of the mental efficiency that is characteristic of the intercourse of the conscious and the subconscious strata. A demonstration of ideal cogency is that furnished by Mr. Hanna's dreams during the period of reconstruction. These were of two types, the one weak and difficult to recall, the other clear and vivid picture dreams. The latter were really recollections of the lost life, though in reporting them the new Mr. Hanna

naturally did not recognize them as such. In one of these appeared a railway station upon which were painted the letters N-E-W-B-O-S-T-O-N-J-U-N-C-T-I-O-N, a set of letters that to the bereft Mr. Hanna brought no enlightenment, and yet were accurately visualized. In the station was a man who revealed his name, whose costume could be described and who through Mr. Hanna's later recollections could be identified as an actual acquaintance. Quite similar in status is the fact related by Professor James in his case of Mr. Bourne, who disappeared suddenly and wandered away to a small town, where as Mr. Brown he kept a small shop, and awoke months later to find himself mentally stranded, knowing not where he was, and returning in memory—as though no gap had occurred in his life's sequence—to the day of the first abandonment of his original personality. Now, three years later when Mr. Bourne, normal throughout this period, was hypnotized and the "Brown" personality recalled, he assumed the "Brown" expression of face and manner and recounted details of his life as a shopkeeper which were hidden from his alert consciousness. Just so when really Mr. Brown, he had on one occasion arisen in prayer meeting and recited incidents which came from his normal experience as Mr. Bourne. Briefly, then, though these cases of reduced and enfeebled personalities require special interpretation by other formulæ than those which we have been tracing, they reveal decided affiliations to the former group, and reinforce the scope and value of our principles.

I am well aware that personally conducted expeditions have their drawbacks; the passenger has an interest in looking to the right while the undaunted conductor regards the left as more engaging; the one lingers where the other wishes to skip, and rushes by where for the other interest holds on. Let me then justify the perspective of my discourse and in so doing venture your further disquietude by pointing the moral which the tale adorns. I have insisted that the status and conception of subconscious functioning must be derived from a somewhat intimate appreciation of the mode of its participation in the normal economy of the mind. On the one hand stands subconscious impressionism, the simple fact that we are and have become diffusely sensitive to our environment and that the oscillations of our mental searchlight are regulated on the whole by consistent though versatile interests. There is, next,

subconscious facilitation, which expresses the supporting procedures that are carried on in the underground workshop of thought, the predigestive, supporting stages of preparations which we cannot altogether command and which yet we do not merely passively await. The happy support of the associative mechanism it has been termed, when applied to the process of thinking things over. With particular emphasis have I directed attention to the fact that the mind's operations are of two affiliated yet divergent moods; the one that of typical wakefulness with an alert availability of the full rounded privileges, the other a falling back upon more passive, natural meandering, which when more completely developed we call reverie. I have suggested that there is a seeming rivalry between the two, to which the advice of "Work while you work and play while you play" seems to appeal; and yet that the deeper draughts upon the imaginative concerns and the closer affiliation with mood and temperament which the latter entails is as significant as any other phase of personality. For this reason we take some measure of a man as readily from his play as from his work, and possibly even from his cups. Pursuing this distinction a stage or two further, we realize that it is the directing, thought-controlling, goal-set activity upon which all training is concentrated, and the successful functioning of which constitutes normal mental health. It is as important, however, to let go as to hold on; and in the trials of insomnia, in the tensions of fatigue, in the restlessness and hesitations of nervousness, we see the type of disturbance that undermines by not giving abeyance and subconscious quiescence their due. At this stage and at my own peril, I detained you by some analyses of just what the normal mental progress entails, what is implied in the very normality both of a moment's procedure and of the integrated personality that results from the accumulation and maturing of our complex selves. Taking advantage of the data thus assembled, I reminded you that the resulting issue is after all but a compromise of rival personalities; that the normality and the unity of the self is an achievement that stands forth upon the supporting acceptance and rejection of the selves outgrown, the selves suppressed, the selves that yet retain at times an unacknowledged, at times a vacation type of existence.

Having put your attentive indulgence to the test, I from the

outset prepared you for the useful and the disturbing aspects of these subconscious supports of our work, our play and our personality. Consciousness is useful; but the mode of its use is complex and the successful regulation thereof an art. It is this at all events in difficult or unstable temperaments whose maturing involves storm and stress, and reaches a safe anchorage after much tossing about on uncertain seas. Yet almost everyone may realize in miniature within his normal experience, the nature of the perplexities which writ large or in strange characters excite our amazement. The lapses of absent-mindedness are peculiarly instructive because of their intimate domestic familiarity and again by reason of their versatility; yet more valuable—as indicating the type of milieu that the abnormal demands—is that furnished by dreams, in which we forsake the normal privileges of the waking self and realize how naturally chaos and cosmos meet in a subjective realm. Had we never dreamed, never been absent-minded, never given over to reverie, never indulged in half directed day-dreaming, never been subject to wayward impulses, never beset by hesitations, never experienced strange feelings of unreality, of slight gaps in the resumption of our normal selves, we should be cut off from a sympathetic appreciation of what mentally abnormal states are, and how with persistence they may invade the mental domain and make of life such a distortion as the conflicting personalities of Miss B. But fortunately no one is hopelessly sane; and even the most stolid incarnation of the office-stool qualities of the mind must be subject to some occasional holiday fancy that proves his humanity. If, however, one must select the most favorable culture for the exhibition of the traits richly illustrative of the wayward issues of the subconscious, it is undoubtedly that of the hysterical temperament. Slowly has the psychologist come to realize that the word “hysteria” is one of the most significant in the range of language. The physician is quite as much at fault for this tardy recognition as is the traditional temperament of the scholar which kept him within the cloistered problems of academic interest. It is only recently that the perspective of symptoms that make up the hysterical diathesis has been intelligibly set forth. Dominating is a mental and emotional instability, an over centralized sense of consciousness connected with the emotional

appraisal of experiences, an undue giving over to day-dreaming, a lax distinction between reality and figment, a weak hold upon the normal, practical, objective interests of life. Combine these in mild quality, without serious physiological impairment of nutrition, and you have mere eccentricity, possibly of temporary status; but exaggerate one or the other aspects of the situation, aggravate it by unwise environment or unfortunate accident particularly in the emotional sphere, or let it chance to find nourishment amid the daily routine, and you may have troublesome instability, malingering or hypochondriac invalidism, evasive and treacherous posing for sympathy and the desire to be interesting; or in another formula, extreme self distrust, false accusation, unbidden thoughts, ill-timed impulses, and all the agonizing tortures of an ingrowing mind. Consciousness truly has its foibles and accidents, its weaknesses and diseases; and it is because of these and their bewildering and kaleidoscopic complexity that the psychologist and physician find a common interest in their decipherment, a common desire to understand and administer to them. It is because I am convinced that the stages of right understanding lead through a survey of the normal behavior and liabilities of consciousness, that I have asked you to follow me upon the trail of the subconscious.

Morals are effective inversely to their length. Yet easy solutions are misleading. The simple life offers no ideal which the psychologist can accept as a beacon or a refuge. The waters upon which he sails are too vast and too deep, the currents too diverse, the conditions of sea and sky too variable, the seasons too irregular, for any simple rules of navigation. Yet the whole art is based upon the fidelity of the compass, the faith in the illumination of our nature that scientific investigation confers. The demand for practical benefit is insistent, and when fairly presented, legitimate; for, after all, harbors must be reached, the traffic kept going despite our ignorance and the perils of the deep. Within our own day and within our own land have appeared the most comprehensive attempts to regulate human life by an appeal to the mental nature, and specifically by utilization of subconscious influences. Let the physician not be dismayed by the fact that the most widely heralded and popular systems repudiate his status, and place drugless healing and anti-medical ministration as modern consummations side

by side with wireless telegraphy and horseless carriages. Nostrums are as inimical to the integrity of his career as are absent treatments; and though appealing to a different clientele, their efficacy is similarly conditioned, their perils an equal menace. It has, however, become a paramount obligation of the medical man to find a place in his theory and practice for the range of influences to which I refer. Mental therapeutics must be legitimized; for the mind is like issue with the body, and sanity is the health of both. The wise incorporation of mental healing can be entrusted only to the trained wisdom of the medical practitioner. That in this pursuit he will continue undauntedly to base practice upon scientific precept is the warrant of his authority, and despite temporary fluctuation will be the mainstay of his prestige. That in this pursuit he is ready to welcome the aid of other disciplines with allied interests and community of purpose, is evidenced by the honor which you have paid to psychology in asking me to address you; that thus re-enforced, the practical and remedial efficiency of subconscious influences may be rendered wisely available to mankind, is the hope with which I conclude.

GENERAL PARESIS

A CLINICAL LECTURE

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I DESIRE to call your attention to a form of mental disorder which represents one of the most clearly defined types of mental disease with which we are acquainted, and yet, at the same time, one which in its different phases calls for no mean exercise of critical acumen, namely, general paresis, or the much poorer term which should be abandoned, general paralysis of the insane. This has the lay name "softening of the brain" which term, however, is used, as we shall see later, to designate more than one condition.

I have pointed out to you at frequent intervals the gradual subdivisions, which are termed classifications, that advancing studies have made in the disorders of the mind. You will recall that of these classifications that of febrile deliria constituted from the very beginning a series of stages which were recognized to be distinct from other forms of mental disorder. It was not unknown to the ancients, however, that certain forms of dementia were associated with paralysis, but it is uncertain just when it was appreciated that the motor defect was a necessary part of the mental disease.* It may be of interest to note that the word *παράλυσις*

* Thus Celsus (30 A.D. *circa*), in the 26th chapter of his third book, which in the main is devoted to the disorders of the mind, speaks of a form of mental disorder which he says "with us, occurs but seldom. The body and the mind are dull, paralytic strokes occur at times, and again at other times there is a disturbance from other disease." Flemming has suggested that Celsus for lack of a better place to put this form arranged it with the apoplexies, and in all our English translations the real relations of Celsus' ideas are lost. Thus Grier considers the apoplexy the important feature and so arranges the translation, but in Almevoelen and Lesart, the idea here given is set forth. Celsus says the Greeks called it apoplexy, but he has put it in his insanities. Whether aphasia, or paresis is meant it is not yet possible to decide.

used by the ancients really means dissolution, and we are not sure that this disorder may not have been in mind. In fact, even at the present time, you will find a school of psychiatrists who deny that general paralysis is a special disease type, but who consider that the paresis is only an etiological factor, and that the symptomatology may be designated by a vast variety of names. I shall recur to this at a later period. It is certain, however, that as early as 1670, Willis¹ distinguished a type of mental disease, which was associated with mental paralysis, as follows: "I have observed in many cases that with their cerebrum out of order to begin with, they became affected by a dulness of mind, and loss of memory, followed by a condition of stupidity and idiocy, and finally developed a paralysis—a succession of events that I used to be able to forecast," and other English authors, notably Haslam and Perfect, described conditions which we recognize at the present time as true cases of paresis. Thus, in 1788, Haslam wrote, in his *Observations on Madness and Melancholy*, "Paralytic affections are a common cause of madness, as men have believed, and are also a common result of mania. Paralytics, as a rule, show disturbances of motion which are absolutely independent of their mental affection. The speech is disturbed, the angles of the mouth are retarded, arms and legs are robbed of their natural motion, and in the majority of cases the memory is greatly weakened. The consciousness of their positions is lost by these patients as a rule. Although so weak that they can hardly hold themselves up on their legs, they nevertheless believe themselves to be strong, and able for the greatest of endeavors."

Esquirol, some eight years after Haslam, namely, in 1796, described the speech difficulties occurring in certain mental disorders, but this noted psychiatrist did not differentiate paresis from other allied psychoses. You will find that most of the historical sketches of this disorder ascribe to Bayle the distinction of having first separated this form of disease from others. And it may in truth be said that Bayle's general conceptions were the most fruitful in developing the ideas which later led to the formation of paresis as a more or less distinct type.

¹ *Anima Brutorum.*

Bayle, in his thesis *l'Arachnitis chronique*, 1822, and in his *Traité des maladies du cerveau et des ces membres*, 1826, established the autonomy of many of the different symptom groups, and sought to bring the whole disorder into line—divergencies from which point of view have been frequent even up to present times. We have seen that Willis says that from certain mental symptoms he could prognosticate the coming on of the paralytic signs, and it is not difficult to read much into his short statement already quoted. But dualistic interpretations up to the time of Bayle were the rule rather than the exception, and the other symptoms considered complications rather than being a part of the disease. Baillanger represented this clinical tendency which has its modern imitators, notably in certain English circles, and we read in Baillanger of excited cases being called *folie paralytique*, and of demented cases being called *démence paralytique*, the two being different diseases.

Bayle, 1823, and Calmeil, 1829, called particular attention to the changes in the pia which have passed current as synonymous with paresis to the present time although such changes had been recorded and correctly interpreted, even if their clinical alliances were not understood.

Esquirol, as early as 1814, called attention to the speech disorders, Georget in 1823 to the epileptiform attacks, and Calmeil in 1826 brought together our first monograph on the disease, in which he taught it to be a disease *sui generis*, without any specific pathological anatomical changes, but associated with the appearance of a chronic inflammation of the pia (cloudiness, thickening, attachment to the cortex, dilatation of its veins) and of the cortex. He recognized the excited agitated types, the depressed or melancholic types, and the simple dementing types, and by 1841 at least, the unification of psychic and motor disturbances was taught by him in a decided manner. We have indicated the false teachings of Baillanger, which were later controverted by Falret, who in a monograph in 1853, gave a masterly outline of the disease largely as we understand it to-day. Duchen, in 1851, was the first German author to take this same stand.

Joffe in 1857, and Westphal, first called attention to the degeneration in the posterior columns, and started the discussion of the

relation of tabes to paresis so well summarized in a recent study by Cotton ("American Journal of Insanity," 1905).

The most important monographs are those of Voisin in 1879, Mendel in 1880, Mickle in 1886, Chase, 1902, and Kraft Ebbing and Obersteiner, 1908. The text book descriptions of Dupré in Ballet's *Traité*, and of Kraepelin's in the seventh edition of his text book, 1904, are the most exhaustive, while from the pathological point of view the study of Alzheimer, 1904, in Nissl's "*Histologische Arbeiten*, Vol. I, will remain the fundamental classic in the field for many years to come.

It seems to me desirable, at this time, that I should call your attention again to the question already raised as to what should be considered a type of a mental disease. That is, can mental diseases be thought of from precisely the same point of view as diseases of other organs of the body; or, shall we be compelled to follow the general idea which is so widely prevalent, especially among the laity, that there is practically but one disease of the mind, namely, insanity, and that which we recognize as types are only illy assorted symptom pictures. Judges only too frequently have this point of view as well, and the whole medico-legal terminology has not advanced beyond this narrow concept.

I desire to negative this latter view most emphatically, and it is at this time that it can be done most conveniently, for modern psychiatry recognizes in general paresis the prototype of a distinct disease process in much the same manner as we recognize a definite disease in other organs of the body. That is, we have advanced to such a point that we may say that, notwithstanding the varying symptom pictures we have in paresis a disease process, with a very definite underlying pathological foundation, which foundation admits, according to criteria established by Nissl and Alzheimer, of little contradiction. Given a patient, no matter what the confusion may be in the interpretation of the clinical picture, who shows the classical pathological changes, this then is a case of paresis, and it becomes the duty of psychiatrists to establish definite clinical criteria, by which it may be set apart from other similar combinations of mental and physical symptoms.

First a word as to the conditions in which the similarities of

clinical symptomatology may be present, and then let me pass to the necessary pathological foundations of this disorder.

It is now clearly established that a number of clinical pictures come to resemble general paresis very closely, and yet are due to an entirely different pathological foundation. It becomes the problem of the future to point out wherein, by a more exact clinical analysis, the minute variations which frequently exist, may be made more valuable diagnostically. These cases are those associated with arteriosclerosis in the senile and presenile states, with alcoholism, with cerebral syphilis, either of the diffuse variety or that type consisting of a combination of gummata with meningeal changes, with tuberculosis of the brain, with cerebral tumor, with diffuse gliosis, allied to multiple sclerosis, and with chronic pachymeningitis. These are the chief pathological conditions which are known to be present in the brains of some patients who have presented a clinical picture undifferentiable from general paresis, and were recognized not to be such only after death. The percentage of these unrecognizable cases (*i.e.*, only recognizable postmortem) has been variously estimated to be from five to ten per cent., but as most of these estimates have been formed before the days of the study of the cerebrospinal fluid for lymphocytes, and for syphilitic antibodies, it is highly probable that a new review of the statistics will reduce this estimate very considerably.

Pathology.—Before entering upon even a short sketch of the pathological features of general paresis, I desire to call your attention to the fact, that much of the easy talk that you hear, and even read in text books, whose authors ought to know better, that we know comparatively little of the pathology of mental disease, is pure buncum. If the authors should be honest and confess that they themselves had not taken the time and trouble to learn what is known, it would represent the truth, for there is an immense field, and it has been very faithfully studied, and the advances in technic are so many, and newly acquired, that it requires a very progressive worker to keep within sight of what is being done with the pathology of the brain in its relations to mental disorders. What is true, however, is that a recognized invariable pathology is not yet established for all of those disorders which we have considered to be clinical types of mental disease. Certainly the same thing has been

true in the study of tuberculosis, if one reads history aright, and it is only beginning to be appreciated how varying are the pathological pictures of the different types of tuberculosis of the lungs. The really efficient methods for studying nervous tissues have as yet been in use very few years compared with the years of progressive study of the comparatively simple lung tissue.

When I show you the Histological Study on the Differential Diagnosis of General Paresis by Alois Alzheimer in the first volume of Nissl's Histological and Pathological Studies of the Cortex, published in 1904, you will realize how difficult a task it is to concentrate in a short talk the features of so exhaustive and fundamental a research. I take it that no one here will hope really to know the problems presented by this disease without reading this work.

What are the main features that are present in the brain of a parietic, who has not died in the very early stages of some intercurrent trouble?

The gross appearances have been described for many years; bear in mind that they are not reliable. They are true for the majority of the cases, but not for all, either in the presence of negative signs, or even with positive signs. These are frequently put down as thickening of the bones, thinning of the diploe, thickening and clouding of the pia, with attachments to the cortex, hydrocephalus internus, externus, granulations of the ependyma, atrophy of the brain and of the cortex. Many a diagnosis of paresis is made on these findings. Such was the diagnosis in the case of Schumann, the musician, who probably suffered from dementia præcox and not paresis; but Alzheimer shows without doubt that all of these may be present, and yet the case be not one of paresis. Senile dementia, dementia præcox, syphilitic gummomeningitis, arteriosclerosis may give in cases any or all of these changes. Thus the diagnosis depends, to be absolute, on a histological examination.

The histological variations are present in the membranes, and in the cortex. No satisfactory histological differential features are found in the alterations of the bones.

The changes in the dura are not of great moment. In rare instances the vessels are infiltrated with lymphocytes and plasma cells. Those of the pia are more characteristic. Practically every

case of paresis shows changes in the pia. Here there is a marked infiltration thickening. There are marked changes in the blood vessels, consisting of a peri-arteritis and lymphocyte infiltration. Plasma cells are frequent, lying in and around the smaller vessels. Many show themselves in a degenerative condition. There is further a proliferation of new blood vessels, these extending into the cortex, with the greatly increased number of connective-tissue elements cause the adhesions to the cortex, formerly held to be alone diagnostic of paresis. Regressive changes in the blood vessels are also very frequent.

The changes in the cortex itself are of the utmost importance. These vary considerably in their intensity, and particularly in their locality, at times they are very diffuse, involving all classes of cortex structures, at other times localized to a comparatively restricted portion of the brain area. Following Alzheimer, we will look separately at the different structures involved, thus taking up in order the changes in I, vessels; II, ganglion cells; III, axis cylinders, and IV, glia.

I. *Blood Vessels*.—These changes have been very extensively studied, and Calmeil, as early as 1826, described the cell groupings about the vessels now known as lymphocytes, and plasma cells. These changes in the vessels are quite distinct from those observed in arteriosclerosis or hyaline degeneration.

a. One of the most striking features is the marked proliferation of new capillaries. These are often extremely rich, often showing like a thick net-work of capillary meshes. These are the product of an active, productive, inflammatory process, and come about through the very rich formation of new endothelial cells, and the branching and vascularization of the regenerating intima. This new vessel formation in some cases is excessive, in others less noticeable.

b. There results an increase of elastic tissues by the formation of new net-works about the proliferating endothelial cells, and a formation of stronger membranes.

c. A proliferation of the adventitia also results, at times slight, again very marked.

d. A dilatation and infiltration of the adventitial lymph-spaces. The infiltrating cells are largely made up of plasma-cells.

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They are never absent even in the most acute case. Lymphocytes and mast cells are also common in the lymph-spaces.

e. In most of the advanced cases of paresis, degenerative changes are common in the blood vessels, especially in the upper cortical layers. A complete destruction of the vessels may take place and hyaline degeneration result.

f. In the cortex of the parietic, a peculiar cell form, Nissl's Stäbchen zell or rod-like cell, is uniformly present. Alzheimer thinks they develop from some of the elements of the blood vessels. Curiously enough Mott calls them collapsed capillaries.

II. *Ganglion Cell Changes*.—a. These are extremely diverse and widespread, but are not of themselves pathognomonic of paresis. Practically no case of paresis is known that does not show ganglion changes of some character.

b. These changes embrace practically all of the forms of ganglion-cell alteration that have been described. Many of these are extreme in grade, as shown by the rapid degeneration, and the necrobiotic changes that are present.

c. A great number of ganglion-cells are completely destroyed in the advanced cases.

d. Not only are the ganglion cells altered, but in all probability the finer nerve structures which lie between the ends of the sheath-covered axis cylinders and the ganglion cells are distinctly involved.

e. In the majority of advanced parietics, the arrangement of the ganglion-cell groups is modified, *i.e.*, the cell architecture of the cortex is changed in lesser or greater degree.

III. *Changes in Axis Cylinders*.—These undergo early degeneration in many cases. Present technical methods do not permit the demonstration of these alterations in the very early stages, but in the advanced cases, the degeneration of the axis cylinder is very marked, such breaking down either being localized or involving the entire cortex.

IV. *Changes in Glia*.—Changes in the connective-tissue elements play a very prominent rôle in the pathology of paresis. In older studies the glial elements were often taken for lymphocytes, and it has only been within recent years that the pathological alterations of the connective-tissue elements have received their proper

share of attention. Let me call your attention to the fact that in the study of this important issue the work of Bevan Lewis, an English psychiatrist, is very noteworthy.

a. In paresis there is a very marked growth of the connective-tissue elements. In the advanced stages such increase of glia elements forms almost a felt of this tissue in the cortex.

b. The major portion of the new glia are found on the outer layers of the cortex, making it stronger, as it were. The thickening due to new glia elements is particularly noticeable about the blood vessels.

These are the fundamental changes, but it is to be noted that the greatest variation exists as to the location of the major modifications in different individuals. Thus a changing clinical picture has its counterpart in an extremely variable pathological involvement. Variation of place of involvement, and time of involvement, with intensity and rapidity all modify the clinical course very markedly. It should further be borne in mind that not only is the cortex involved, but the basal ganglia, the cerebellum, the medulla, the pons and the spinal cord are subject to the exact type of pathological alteration that I have just described. Pathologists have a tendency to extend the limits of the pathology of paresis to other organs of the body.

With the possibilities then of such endless variety of pathological variation, it is not to be wondered at that so many clinical pictures are known, and how rapidly the clinical picture may vary from week to week and from month to month.

It is certain that pathological alterations may exist for some time without sufficient disturbance of function to create any symptomatology. Physical symptoms may precede the mental ones, or vice versa. The order of the symptoms will depend essentially on the site of earliest or worst involvement, and as our cases are studied more in detail, it becomes evident how rich the picture is. Thus, it is known that certain cases have begun with hallucinations of hearing. Accidental death before the development of other symptoms revealed changes typical of paresis confined almost to the temporal lobes. This instance shows how important it is to weigh every symptom and to realize the need for caution in approaching all mental cases.

Those patients who show a similar picture in the great majority of attacks have what we call classical paralytic dementia, but let us all bear in mind that statistical studies, while very useful in telling you what has happened, are of little service in the first case any one of you may see. You are very liable to see the non-classical cases, and to fail to recognize them.

In the majority of the cases which have been studied anatomically, it is found that the entire cortex is involved. The greatest involvements are found in the occipital lobes, the poles and the anterior ends of the convexity of the frontal lobes, the parietal lobes and the central convolutions. The amount of involvement of the temporal lobes seems to be subject to the greatest variation.

Paralytics with more or less well-marked local signs of spots of cerebral softening causing partial paralysis, aphasias, etc., belong to the rarer kinds met with, yet they do occur. Hoch has recently reported such a case in full. Alzheimer enters into the literature thoroughly.

Etiology.—We will not stop very long with the etiology. Let us assume its syphilitic nature. This seems to be the chief factor, not so much from the statistical enquiries which have led most clinicians to teach its importance in paresis, but by reason of the newer studies of Alzheimer on the character of the pathological alterations which show it to be an inflammation primarily involving the nervous parenchyma, and associated with vessel and neuroglia changes which point to a neurotoxic causation factor, but also by reason of the work of Wassermann and Plaut, and many others, who find that in the cerebrospinal fluid there is a peculiar substance that shows a definite reaction to syphilitic virus—a specific antibody—which seems to settle the matter. Just what the relations of this type of syphilitic poison may be to that of acute syphilis is still an unsolved problem, the factors of which I shall not even attempt to state. Contributory factors there may be, and these should not be overlooked. Not all syphilitics develop paresis. This is an important field in which many problems lie to be solved.

Before going any further, let us turn our attention to several cases which are here before us.

CASE I.—W. S. This is a young Irishman, a clerk, married, with three healthy children, who has just come into the ward. He

has been in this country 20 years, and has always been an industrious and trusted employee in a large importing house.

You note in the first place that he is somewhat excited. His face lights up with a smile, and he laughs and jokes. His feet are tied with sheets, and he makes a few attempts to release them, and then sinks back, telling us with a smile and a laugh that it is a great joke.

He tells us that his father and mother died of old age, and laughs at the idea of there being any nervous disease in the family. He tells us he had measles and scarlet fever in childhood, but no other disease. He denies syphilis, yet you note a number of suspicious symmetrical copper colored spots on his body, which are very evidently tertiary syphilis.

In response to questions as to his whereabouts he says, "Why this is a hospital; I don't need to be here. I-I-I'm not s-s-ick. This is a joke. Why I've got a suit of clothes worth \$35 and a watch, and you've got me t-tied up here"—laughing—"why it's a joke."

You note, as he tells me this, he does not seem to show any anger; he is constantly reaching down to loosen his feet and laughs. "I never felt better in my life. Why did they bring me here? I don't know. I think it was a joke." He tells us that he has been working as a cashier in Vessey Street. He remembers the number. Is not quite certain about the year of his birth, although he knows his age. He said he noticed that the bookkeeper made a mistake of \$30 in the books, and that money was coming to him. He could give no definite reasons why he had left his place. In fact, he had been discharged some time past for drinking too much, and went to the office every day bothering them about the alleged mistake of \$30 he had discovered in the books.

You note that he is approachable, is alert, fairly attentive. There is a monotony about his movements, however; they do not seem to be well directed; and he lies back every few seconds, with a grin, saying "it's a joke." You have probably noticed that there is a marked tremor of his hands as he sits there, and also that as he talks there is a definite tremor of the lips and of the tongue as he protrudes it. His speech, you observe, is slurring and stuttering at times. Note how he pronounces after me the words "National Intelligencer, Methodist Episcopal, Third Riding Artillery Bri-

gade." You note that on these test phrases he stumbles and stutters. Looking closer, you notice that one pupil is wider than the other, and that one is more sluggish than the other. His knee jerks are active, there is no clonus, no Babinski, no Oppenheim, no paradoxical reflex. You note that he is very voluble, but that he keeps saying the same thing over again; not in the verbigeration fashion of the precocious dement, but in a manner which shows he is distinctly dull or stupid, and somewhat hazy or confused. As you test his memory, you find he makes many slight blunders,—" $7 \times 6 = 42$, $8 \times 7 = 63$, $7 \times 8 = 56$, $9 \times 6 = 66$, $6 \times 9 = 54$ "—he makes these stupid mathematical blunders. The excitement might remind you of a press of activity of the maniac, if it were not so uniform and monotonous—badly executed. His speech is fairly voluble, but the association of ideas is not such as you have seen in the maniac phase of maniac-depressives; there is a loose association, which is more of a disconnected ramble.

We learn further, that this condition has developed slowly in a man 45 years of age; that he has been getting careless in his work; his relations with women have been becoming fairly loose; he began to drink rather heavily, coming to business about when he cared to; he was warned, but this doing no good, he was discharged. He pulled up a bit and was reinstated; once again to slip back into loose habits. In letters which he wrote to Ireland, he had planned some large enterprises. He was going to bring over his whole family, and they were going to do big things.

Just a few weeks before coming into the hospital, he was much agitated. His landlady says he used to walk the floor night and day, and that he would tear letters, papers, etc., into little bits of scraps and throw them out of the window, as though they were confetti. On being told not to make such a muss in the street, he promptly set fire to the little pieces, and threw them while burning into the street. He could not explain why he did this, although he denied indignantly that they had set fire to a curtain in a neighboring house—which was a fact.

Although he still retains a fair degree of intelligence, it is clear that there is a slight grade of defect.

This is an excellent example of a paretic in an early phase, and showing the physical signs more markedly, although indubitable

mental signs are not lacking. Up to the present time, he has shown no delusions unless one assume the \$30 mistake in the books, to be one, and he has no hallucinations. He is excited, and, if subjected to restraint, is liable to become very violent. This is the type of case which, if let alone, may run for some time without much apparent deterioration, but when subjected to the restraint of an institution goes right up in the air, gets extremely violent, and is likely to die very shortly from exhaustion.

The next patient, to whom I wish to call your attention, presents features of even greater interest from the viewpoint of diagnosis. In the last case there is no excuse for any mistake in this regard. It is true that some physicians might call it a mania, but this would be due to lack of experience in mental diseases, or to careless observation. In this patient the correct appreciation of the disorder is not so apparent.

CASE II.—J. E. B., 43 years of age; married. He is an Irishman, has been in this country since he was 6 years old, and is a policeman. He has one son living. He has always been a healthy man; he drank steadily, though not heavily, but gave it up about a year ago, as he felt it was doing him no good. He denies syphilis, and there are no visible signs of this disease on his body. He came to the hospital a few days previously of his own accord, saying he felt tired and needed a rest. He eats well, sleeps well at present, and feels that he has improved. He is well nourished and is apparently a strong man. Without going further into his history, let us see for ourselves what we can.

You note his manner is quiet and contained. He is placid and shows no signs of excitement or depression in his countenance. It is a little lacking in expression one might say, or denotes tire. His expression in general is not as vigorous as his size, age, and occupation might indicate.

In answer to questions he tells us that he is feeling better. He speaks you note in a quiet way, slowly and with a very slight retardation, *i.e.*, compared with the average of mankind. This may be his natural method of speech as he is not slower or more deliberate than many men, yet the slowness and quietness of manner are to be observed. He is quite particular in his enunciation, as though it were an effort for him to say things exactly as he would like, which

is suggestive of the neurasthenic reaction. You note on his repeating the test phrases that he says them correctly, and does not stumble, although they are pronounced in the precise, yet expressionless, or monotonous tones which characterize his whole speech.

Testing his motor power, we note a slight variation in the muscles of the face, the right side not having quite as much "life in it" as the left, yet there is no paralysis. The grasp, kick, push, etc., are equal and about up to a policeman's average. All of these movements, however, are made in a slow and deliberate manner, which is suggestive of the retardation of a maniac-depressive, but yet is not so marked. He has a slight tremor in his outstretched fingers, but it is not great.

His tendon reflexes are slightly exaggerated, but equally so; there is no ankle clonus, no Babinski, Oppenheim, or paradoxical reflex. There are no disturbances of sensation, save as we shall learn later. The pupils are dilated, at present they are slightly uneven, the right being a trifle larger than the left, but yesterday this was not the case, especially in the morning after he had had a good sleep. There is no Argyll Robertson pupil. No other neurological anomalies are obtainable.

He is well oriented as to time and place; his perceptions are normal. His association of ideas is a trifle superficial, and their time reaction slowed. His grasp is slow.

Asking him how his trouble came about he tells us that "Registry day, 1907, while on duty in front of the police station, he was leaning against a railing, and he kept this position for some time. When he stood up he noticed a numbness in his hands, which felt as though they were asleep. This went away, and he thought no more of it. He remembered he told his wife about it. He went back and was sent to another precinct. A short time later he noticed that his urine dribbled from him, or when he did urinate, the urine came in spasmodic bursts. He became nervous, could not sleep and had cold sweats. When he stopped work and went under treatment his urine troubled him no more.

He then noticed that the feeling of nervousness would come and go, in attacks as it were. They began, he said, in his head, leaving it numb; this went to his arm, and finally into the face. He could not talk for a nervous clutching in the throat, and while having

one of these feelings he was helpless. They soon passed off and left him very nervous."

This is the entire history up to the present time, and unless due stress be laid upon these paresthesiæ, the slow, almost dull flow of thought, the lack of initiative, the transitory bladder involvement, and the very slight irregularity in the pupils, one will put him down as a neurasthenic; perhaps even think that the peculiar clutchings at the throat are hysterical, yet this is undoubtedly a patient suffering from general paresis in the so-called neurasthenic phase which is so frequently a forerunner in this disease.

It is important constantly to bear in mind, whenever an adult about 40 years of age, comes to you suffering from the signs of a nerve tire or neurasthenia that there is a possibility of this disease, and a careful examination, going over the entire body, will repay your industry. I would call your attention particularly to the search for sensory anomalies, and ask you to be governed in your examination by the general rules laid down by Head in his *Studies on Sensory Anomalies*. You should test not only for light touch, for pressure, for pin prick, head and compass points, but particular stress should be laid on the bony conduction of sound vibration, on joint position and of pain due to deep pressure. Even in the earliest phases you may note some sensory disturbance that is more than can be accounted for by neurasthenia. In the present instance you note the marked sensory defects that this patient has to pain on deep pressure, especially in the arm in which he felt his paræsthesiæ. The monotony in this man's voice is also worthy of careful analysis. He has no true disturbance in his speech, no hesitation, no stumbling, no loss on the r's, p's, b's, yet you note that it takes some effort for him to get himself up to a good measure of performance. The vocal cords, however, are more than tired. The nervous regulation is being interfered with somewhat. It is not unusual to have the vocal cords affected very early. In singers, for instance, it is very striking, and not infrequently a diagnosis of paresis may be made first in an actor or singer, the giving out of whose vocal cords first calls attention to a disorder which has undoubtedly been present for some time.

CASE III.—Now let me call your attention very briefly to this third case, which you can tell at a glance is one of general paresis.

He is 40 years of age, a carpenter; who was infected about fifteen years ago. He has been sick about one year, beginning in much the same ways as the disease in Case II, advancing at about six months to the stage which you have observed in Case I. We here find another phase of this many-sided psychosis. You noted with what a confident air he looks about; his whole bearing is one of confidence and self-satisfaction, and yet at the same time you can perceive that there is a slight inequality of the muscles of the two sides of the face, that he has a marked tremor about the muscles of the mouth and nasolabial folds, that his hands, as I ask him to stretch them out, have a distinct tremor, and that as he speaks his words stumble over each other very distinctly. He omits words, you will later observe. As I tell him what a fine muscle he has, you note how he feels it with satisfaction and says, "Yes, Doctor, I'm a strong man. Sullivan in his best days was nothing alongside of me." He goes on in a rambling manner, trying to tell you what he can do. Questioned as to whether he got the strength digging gold out of gold mines, he tells us how rich he is. What he is going to do with the million dollars a day that he gets; how he is going to start a fine establishment, and have two billion horses; his confidence in his various projects is unbounded, and they have such an absurd valuation that you recognize the typical megalomania of the parietic. Such megalomaniacs are often unbounded—anything you suggest he will take up and elaborate, all showing how well he will succeed, no matter what others have done before him. There is a certain lack of interest in what he says just now—he has none of the brightness of a patient in the maniacal phase, although he shows a certain amount of suggestibility in taking up ideas, a very characteristic divertability, and at times a loose ramble of ideas which suggests flight of ideas, and in some patients with paresis may be a true flight, just as in a manic; but his very obvious memory defects, his physical signs, his megalomania are too characteristic to admit of question.

This morning he was in a wild state of excitement: he was shouting and noisy, and for two days has been soiling himself. About three weeks ago he had an epileptiform convulsion and was hemiplegic for about three or four days. This has disappeared now, yet you note a difference in the facial innervation, his grip is unequal, and although both tendon reflexes are active that of the left

side is more marked. He shows some clonus on that side as well.

This leads me to say a word about these epileptiform or apoplectiform convulsions, which are not infrequent in general paresis. It is occasionally observed that almost the first sign known to a patient's uncritical environment will be a convulsive seizure, from which the patient usually recovers in three or four days with little trace of any difficulty. These early attacks are unusual, but occur with sufficient frequency not to be forgotten. In the course of a paresis, especially if it be at all active, convulsive phenomena either epileptiform, or apoplectiform, will occur in at least one-half of the cases before death, and such attacks are often the cause of death. It is noteworthy to observe, notwithstanding the extreme severity of the convulsive attack, the hemiplegia, etc., that it will usually clear up in a comparatively short time. Occasionally we find permanent atypical localized lesions (Lissauer's type).

This type of case, which is spoken of as the classical type of paresis, is worthy of careful examination. We are told by many that this type is changing; that the demented and simple depressed types are becoming more frequent. This I am unable to believe, and feel that what has changed is, not the disease,—this has been affecting minds of much the same type for thousands of years—but our clinical insight into the many vagaries of the disorder has been greatly sharpened and that while thirty years ago only those who showed the megalomania, etc., were thought to have paresis, we now recognize that the grouping of symptoms is largely accidental and non-essential, hence the quiet, slow dementing, and depressed paretics now enter into statistics under the proper cognomen.

CASE IV.—Now let me call your particular attention to this young man, 38 years of age, a reporter, who appears to be perfectly well. I wish you to talk to him and examine him individually, for when I say that he seems perfectly well, and not one physician in a thousand would suspect that he was a sick man, you will be astonished at what I shall tell you concerning him.

He is perfectly oriented, his memory is perfect, he acknowledges syphilis thirteen years previously, also alcoholism, not marked. His speech is slightly rapid, but this is his usual manner. He is bright, energetic, and for six months has been carrying on a successful business as a real estate agent, although he is not working very hard.

His pupils are equal and react to light and accommodation; he has no tremor. There is slight loss of knee jerks and he says he feels like a trivet, and is as sound as he ever was.

Search where you will and you will be unable to find a trace of illness in him, and yet, one year ago this young man, whom we have just excused, was a bedridden, apparently hopelessly demented parietic, worse than any you have yet seen. He had unequal pupils; had a stammering, stuttering speech, and was worth millions. He expressed delusions of all fantastic characters, was megalomaniac, hallucinatory, and violent. He soiled his bed, and had three severe apoplectiform convulsions. This condition was of gradual onset, persisted about six months, and a month before he began to recover he had his third epileptiform attack—he was dumb, almost moribund, and did not know anything. He gradually picked up, and after a month was able to be about. In two months he went home, and is now, nine months later, in the condition in which you have just seen him.

This patient is in what is known as a "remission." In some unknown manner the acute, productive inflammation in his brain tissues has subsided, and has left him comparatively well, but,—and here is the important lesson to be drawn from the case—if the diagnosis is correct, and we have not mistaken a case of cerebrospinal syphilis, or acute alcoholic dementia with epileptiform convulsions for paresis—and this is possible—this patient will again be sick, and will ultimately die of general paresis. In this case a lumbar puncture showed the typical lymphocyte count, thus excluding alcohol as an exciting cause—it may be a case of cerebrospinal syphilis, and most of the so-called *cured* cases of paresis are this disease; but the general development of the disorder has been such as to make us feel that it is a case of paresis. Look out for these remissions then, and govern yourselves accordingly. They sometimes last as long as two years, although six to ten months is the average.

Varieties.—A brief word as to types. In our pathological study we have seen why so varied a clinical picture may be present; yet the cases as they are seen follow certain lines,—(1) demented forms, which go slowly onward; (2) depressive forms, like our Case II; (3) expansive or classical forms, like Case III, and (4)

agitated forms, like Case I, are the most usual. It should not be forgotten that the picture changes from week to week in the vast majority of cases, and only a few cases will run by the set conventions of a textbook description.

Course.—The course of the disease is uniformly fatal. In some patients death takes place within comparatively few months; while other patients are known who have lived, 10, 12, 14, and even 21 years.¹

The most recent and available statistics on this interesting question may be found in an analysis of over 3,000 cases in the Berlin Asylum of Dalldorf by Junius and Arndt (Arch. f. Psych., vol. 44, heft. 1, 1908).

It is established that few patients suffering from general paresis live over six years after the onset of their illness; in the cases cited, less than one per cent. of the 3,400 cases lived over six years. A great many (about 19 per cent.) died within the first year, about 25 per cent. in the second year, 25 per cent. in the third year, 7 per cent. in the fifth year and from 7 to 10 per cent. lived over five years.

Differential Diagnosis.—In what I have said on pathology, I have clearly indicated to you what the important features are which enter into the question of differential diagnosis. It will not be necessary for me to repeat them at this time, and I shall ask your strict attention to the different disorders, the pathology of which I have detailed, and the symptomatology which it is necessary to bear in mind in order to exclude these factors.

Treatment.—From one point of view there is no treatment for paresis, yet at the same time this only expresses the general attitude towards the possibility of remedial agencies in the cure of the condition. There is a great deal that can be done for the parietic individual to make him more comfortable, and to remedy the disturbances and distress in the household of which he is a member.

It is in the first place, I believe, absolutely essential that as soon as a diagnosis is made a proper representative of the interests of the sick individual should be carefully instructed as to the probable outcome of the condition. You should always bear in mind, therefore, the possibility that you can make a mistake in the diagnosis,

¹ Kraepelin, Behr, Sprengeler, Heilbronner, Kaes, Lustig.

and should therefore reserve for yourselves the right of a definite standpoint. The property interests should be conserved at once, for it is very characteristic that a parietic dissipates his fortune in riotous living, and in large communities particularly, is preyed upon by numberless human parasites, male and female, who infest such communities.

Careful notes should be taken and kept by you all, because very important medico-legal problems may later arise in the matter of the making of wills, deeding of property, etc., by such sick individuals as a result of their weakened powers of resistance, and their hypersuggestibility when surrounded by self-seeking interests.

The treatment in these cases is essentially an economic and social one, and your responsibility in this respect should be carefully considered. These patients should be watched very carefully if there is any suspicion whatever of cerebrospinal syphilis, and such a suspicion we have already seen can never be entirely eliminated. Prompt mercurial treatment should be instituted. From my own point of view I am very skeptical on the question of the possible relationship of mercurial poisoning and cerebral degeneration, so that prompt antisyphilitic treatment is not calculated to do any harm whatever.

It is advisable, in practically all instances, to have these patients immediately adjudged incompetent and to have them placed in some private or public hospital where they can be taken care of. It is useless, as a rule, to attempt to treat them at home. In the neurasthenic phases it may be necessary to use hypnotics, to assist sleep; it may be essential to give analgesics to overcome pain; it may be desirable to give bromides to quiet excitement. For the treatment of excitement which is excessive there is nothing so valuable as the prolonged bath, which is far better than any other mode of treatment.

Restraint, chemical or physical, usually acts disastrously on the parietic, tending to excite him, and to hasten the exhaustion which brings about death.

Neurology

THE ESTIMATION OF SO-CALLED FUNCTIONAL NERVOUS SYMPTOMS

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THERE is no more puzzling problem in neurology than the valuation of symptoms appearing in the psychoneuroses. The practitioner after having been deceived into giving a grave prognosis in a given case, only to see the most alarming symptoms resolve themselves into harmless manifestations of hysteria, is tempted to estimate lightly similar symptoms appearing in another case, in which the autopsy shows tumor of the brain, or meningitis. The pendulum now swings in the opposite direction, and the practitioner is tempted to regard seriously each indication of hysteria. Doubtless every neurologist has swung between these extremes until he has finally settled upon a line of diagnosis and prognosis depending somewhat upon his own experience and his own mental trend.

But even after long experience and study has enabled one to gauge the value of symptoms as regards their organic or functional origin, it still remains to estimate the character of the varied symptoms falling definitely into one or the other category.

The symptoms of hysteria are characterized by a marked mental element, in fact, hysteria has been termed a disease of the imagination, a result of auto-suggestion and the like. One definition is "a disease in which the mind unduly influences the bodily functions." Such considerations tempt us to attribute to mental vagary every manifestation of physical disturbance which is known to have no underlying lesion of the nervous system.

Let us consider the case of a certain athletic young man who recently consulted me. He has been subject for years to recurrent swellings of various parts of the body. The swelling may appear in the hand, the foot, or elsewhere. It is painless, is unaccompanied

by fever or other constitutional disturbance, and disappears in the course of a day or two, perhaps less. This we recognize as angio-neurotic œdema.

He tells us that his mother has been subject to such attacks all her life, and that his sister was subject to them up to the time of her death at 16 years of age. This fortifies our diagnosis, but when he states that his sister died in an attack in which the throat was involved, we are reminded that this form of œdema sometimes attacks the glottis with fatal result, and we are forced to give a guarded prognosis in an apparently harmless affection.

When we further learn that he has suffered from periodic attacks of violent abdominal pain with vomiting and diarrhœa, putting him to bed for several days, we are reminded that when this affection attacks the abdominal viscera it is not painless and, as Osler has pointed out, it may assume alarming proportions. In one of this patient's attacks, in fact, the symptoms were sufficiently serious to cause the surgeon to open the abdomen, with no result beyond finding a large amount of free, clear fluid.

The pathology of these abdominal attacks is not clear. It seems improbable that the mere presence of the clear fluid in the abdominal cavity should cause colic, vomiting, and diarrhœa. It is not improbable that we must have recourse to Osler's explanation of similar symptoms in generalized telangiectasis, namely, that there is infiltration also of the gastro-intestinal wall.

Angio-neurotic œdema, then, is not to be lightly dismissed. Still less is it to be regarded as a mental phenomenon, even when it appears, not, as in our case, in a robust and evenly balanced young man, but in a typical hysteric.

A peculiar case, perhaps of this nature, has been recently brought to my attention. The patient has been taken, at different times, to various hospitals, suffering from intense abdominal pain and other symptoms of alarming character. In the majority of the hospitals his disease has been regarded as serious, and operation has been urged upon him. In at least one of the hospitals, on the other hand, his complaints were regarded as hysterical, purely imaginary, and not worthy of attention.

The œdema represents a disorder of the circulation, dependent upon no organic lesion of the nervous system, but rather to its faulty

method of performing its functions. It is true that the mind has a certain influence on the automatic bodily functions, such as the digestion, the sleep, and notably the circulation. True it is that a certain habit of mind may favor blushing, and that the cultivation of indifference may tend to inhibit it. A sense of shame may cause a sudden flow of blood to the head, while fear may send it into the portal system. Similarly, it is supposable that there may be some obscure and unconscious connection between mental habit and angio-neurotic œdema. The assumption, however, that such œdema is directly attributable to a disordered imagination, or even to auto-suggestion, would be hardly tenable.

œdema must rather, when occurring in a hysterical person, be counted as one of the physical signs of a peculiarly constituted individual, or "deviate," just as the hysterical mental tendency is another sign. Similarly in "hay fever," the mind may, perhaps, have an influence upon the flow of fluid from the mucous membrane of the naso-pharynx, set up in the susceptible individual by pollen, but the supposition that such flow can result directly from the action of the mind is by no means certain. I have heard that such flow has been produced by artificial flowers, but I confess to some degree of scepticism on this point, and should be glad to know the details of the experiment.

This phenomenon, like the angio-neurotic œdema, may be deemed a physical evidence of deviation, perhaps coincidental with, but not caused by, mental irritability.

The tendency to dermatitis upon exposure to *rhus toxicodendron* is perhaps more prevalent among neurotics than others, but no one would claim that either imagination or auto-suggestion here plays a part. The application of the term "thin skinned" to the neurotic is not, perhaps, altogether figurative.

Certain temporary ocular symptoms are prone to appear among neurotics, and to simulate serious disease. Such are the periodic ocular palsies, the ptosis, and the temporarily immobile pupil.

I find in my notes the following typical cases:

CASE I.—A man of 33, was seen in consultation with Dr. Sarah Palmer, 12 years ago, on account of dilated and immobile pupils. At this time he was studying medicine. Three years before he had noticed drooping of the left eyelid, which came on rather suddenly

after a period of hard work and worry. This had recurred at intervals when he was tired. He was now not working very hard. His general health was good: his habits were good. He had not used tobacco for a year before the onset of the trouble. Examination was negative as regards motion, sensation and reflexes. There was no other cranial nerve involvement. The pupils were both large and did not react to light though they did to accommodation. The movements of the globe were normal. There was no lid-drop.

These symptoms rapidly disappeared, and I next saw him in June of the following year. At this time he had been working hard taking examinations. The left pupil had suddenly become dilated and there was decided lid-drop. At this time the pupils did not react to accommodation or to light. The trouble was already lessening.

When I saw him a week later he was as well as ever. The loss of accommodation had lasted three or four days only, and he could then read perfectly. Examination showed that the pupils reacted to accommodation but not to light. The lid-drop had disappeared, and the examination was otherwise negative. The entire trouble shortly disappeared and has not recurred.

To-day the patient is a successful practitioner of medicine and is perfectly well.

CASE II.—A young lady of 19, attending school, seen in consultation with Dr. Townsend in the fall of 1896. She had returned to school rather debilitated, and had been taking tonics. Three days before I saw her there was no trouble in the eyes or other symptom. She suddenly became dizzy and saw double on Monday. On Tuesday there was marked external strabismus and vertigo, the vertigo disappearing when the eyes were closed. There was paralysis of the internal recti of both eyes, without lid-drop or disordered pupils. The fundus oculi was normal. The trouble rapidly disappeared without special treatment, and in the course of a week the eyes were straight.

The patient is now in perfect health, is married and has two children. I am informed that there has been no recurrence of the ocular trouble.

Is it an unreasonable suggestion that in such cases as these a

sudden localized œdema affects the ocular nuclei and rapidly disappears?

CASE III.—The following case was recently seen in consultation with Dr. Proctor.

The pupils of a man of 34 were dilated by a mydriatic 3 weeks ago. One pupil quickly returned to normal size, but the other did not, and paresis of the internal and superior rectus with lid-drop supervened. These symptoms are present to-day. The patient gives a history of attacks of temporary dilatation of the right pupil during the past three years, recurring several times a year, and lasting several days. The man is extremely neurotic, self-centered, unduly apprehensive, given to worry in general, and almost thrown off his mental balance by his present condition, though it affords him no discomfort, and impairs his work in no way excepting through its appeal to his fears. The pupil is round. The most searching examination fails to reveal further sign of organic disease of brain or spinal cord.

I am inclined to think that this symptom will, shortly subside, and that no untoward consequences will ensue. This does not mean that the ocular paralysis results from imagination, or from auto-suggestion, but that this disorder of function, whether due to local œdema or other temporary lesion, is part and parcel of the general faulty make-up of this individual, in other words, of his "deviation," physically as well as mentally, from the average normal standard.

On announcing the decision to the patient I was met by a fire of questions and arguments revealing a knowledge of the anatomy of the brain and of the pathology of brain affections which would do credit to an embryo neurologist. In other words, he is somewhat hypochondriacal. This fortifies the supposition that his symptoms are functional, but by no means establishes it, for the hypochondriac, like another, may have a real disease which underlies his fears. Here again, is opportunity for careful weighing of evidence.

There is still another set of symptoms for which no physical basis has been found, and which have been too often slightly relegated to the hysterical class, to the chagrin of the medical attendant, and the indignation of the friends, when the outcome

has proved fatal. I refer to the temporary paralysis seen in certain cases of myasthenia gravis, or asthenic bulbar paralysis.

The sufferer is most often a young woman. The history of her case is such as to tax the credulity of the practitioner unfamiliar with this malady. She states that at times she is unable to do up her hair without resting her elbows on the mantel, but the most prolonged and careful examination fails to reveal weakness in the hands or arms. She places the hands freely upon the head and keeps them there indefinitely without sign of fatigue. She states that she frequently stumbles and falls without apparent cause. In one case mistaken for hysteria, the patient stated that on one such occasion an infant had dropped from her arms down the stairs, a fact which should have aroused suspicion of serious disease, since hysterical symptoms rarely result in injury to the patient or to another.

Temporary, as well as continuous, ocular paralysis is common in this disease, producing ptosis and strabismus. Temporary, as well as lasting, interference with speech, mastication and deglutition is not rare. It is these symptoms which have suggested the name *myasthenia bulbaris*.

The symptoms may remain permanent, but with marked variations.

The accompanying photographs show the temporary paralysis of the eyelids in a patient with myasthenia, in the Neurological Department of the Massachusetts General Hospital. The symptoms preceded his death (from intercurrent affection) by two years, and consisted of recurring paralysis of muscles of the eye, throat, and extremities. The pictures show an attempt to close firmly, and to open widely, the eyelids.

I have recently seen a puzzling case, the symptoms of which may prove, on the one hand, those of myasthenia gravis or, on the other, to be quite innocuous. The patient is a young, well-nourished, married woman, with two children, one of whom has repeated convulsions, and can take milk in no form. She is athletic and when at her best is the picture of health. She has a somewhat neurotic family history, but no sign of hysteria, nor has she shown the ordinary signs of hysteria. She is, perhaps, of a rather intense disposition and inclined to over-worry with her family cares.

FIG. 1.



Ptosis of eyelids.

FIG. 2.



Ptosis of eyelids.

One year ago she was wrought up by the death of a child, and during the past year has been somewhat irritable. In the course of the past year she has had a great number of attacks similar to the one which I witnessed. They are becoming more frequent; within the past ten days she has been six times in this condition with intervals of perfect health.

When I saw her she was lying on the bed with pupils very widely dilated and not reacting to light. On asking her to stand, her knees gave way, and she required assistance to keep on her feet. The knee-jerks were very sluggish (though the attending physician states they are normally active). The plantar reflexes were absent. There was weakness and unsteadiness in the upper extremities. The speech was somewhat indistinct and she found it difficult not only to choose her words but to remember the commonest instances in her life, for example, she was unable to state where she had spent the summer. The pulse was rather rapid, 120, otherwise of good character. The heart beat was normal. The fundus oculi was normal. She stated that she had no pain. It was with difficulty that she could even roll over in bed. There was no odor of alcohol about her, and in the history there was entire absence of headache, nausea, tremor or other characteristic sign of alcoholism either during or after the attacks, and the husband was absolutely confident that she had had no access to alcohol.

The attack passed off in a few hours. When I next saw her, the knee-jerks were active and the pupils reacted perfectly.

The pathology of these cases, as of the periodic ocular paralyses already considered, is conjectural. In the typical cases Gowers suggests congenital nutritional defect and calls attention to their analogy to the well-recognized dystrophies, though in the case of myasthenia no definite atrophy appears. Is it not within the bounds of possibility that temporary and circumscribed angio-neurotic œdema may occur in the central nuclei in some of these cases with intervals of health, and that in the event of the œdema involving the vital nuclei of the bulb, it may cause disastrous results before its absorption?

Whatever the pathology of these and allied physical signs in the neurotic, their study should lead the practitioner to be on his guard in casting the prognosis, and to remember that he has not

merely to avoid mistaking signs of disordered function for signs of organic disease, but to avoid regarding too lightly all such signs simply because they appear in the neurotic individual.

I have made no allusion to the ordinary palsies, contractures, hyperæsthesias and anæsthesias of hysteria, which, however troublesome, never seriously menace life. It is familiarity with the generally favorable outcome of such symptoms that misleads the practitioner in presence of the apparently similar symptoms of myasthenia gravis, a disease which claims a large percentage of fatality.

It is important then, carefully to weigh evidence for and against a physical basis for apparently functional symptoms, and further, to abstain from deeming them necessarily of mental origin and of trivial import.

It is also desirable that the practitioner familiarize himself with those signs of functional disease which may, after all, have some such elusive physical basis as angio-neurotic œdema. There is no reason to assume that the brain alone is exempt from this pathological condition, a fact to be borne in mind in hysteria and allied disorders, whose striking, but not sole characteristic is mental deviation.

THE DIAGNOSIS OF INJURIES OF THE PERIPHERAL NERVES FROM THOSE OF THE SPINAL CORD *

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At first sight it may appear that a discussion of the diagnosis of injuries of the spinal cord from those of the peripheral nerves is of little practical importance, and that the need for it rarely or never arises. Such is not the case. In the cervical and sacral regions of the cord injuries occur, which may, on superficial examination, resemble those of the peripheral nerves. I need instance only an injury to the cervical spine associated with a lesion of the spinal cord producing symptoms so like those due to brachial plexus injury that a mistaken diagnosis is not infrequently made. It is on account of the gravity of this condition, if not recognized, and of the necessity, if correct treatment is to be adopted, that an injury of the cauda equina should be distinguished from one of the spinal cord, that I am drawing your attention to this subject.

It will be necessary in the first place to remind you very briefly of the result on motion and sensation of an injury to a peripheral nerve and the grouping of sensation in the nerves and posterior roots, then to discuss the effect of lesions of the cord on motion and sensation and the grouping of impulses in the cord.

Complete division of a mixed peripheral nerve, either anatomical or physiological (that is, with severance of anatomical continuity or with continuity intact) results in paralysis of the muscles supplied by it. Changes in the electrical excitability of these muscles takes place leading to the development, at about the end of a week, of the reaction of degeneration. Sensibility to light touches with cotton wool is lost over an area corresponding well with that given in anatomical text-books as supplied by the nerve;

* A lecture delivered at the Medical Graduates' College and Polyclinic.

this is well defined. Within this territory of loss of light touch, there is an area insensitive to the sharpness of the prick of a pin and all degrees of temperature. This is ill defined, and varies from patient to patient. Within the whole of the affected area the patient is, in most cases, able to appreciate all forms of pressure; stimulation with a needle is recognized as pressure, but cannot be distinguished from the pressure produced by the blunt end of a pencil.

When a nerve is incompletely divided, sensibility suffers equally with motion, except in those nerves, the musculospiral below the point at which its external cutaneous branches are given off and certain anterior primary divisions, complete section of which produces no demonstrable effect upon sensibility. Paralysis of muscles results in most cases in which a mixed nerve is incompletely divided and the electrical reactions of the affected muscles undergo a change commensurate with the degree of injury to the motor fibres. In most cases the reactions which I consider typical of incomplete division are present.¹ Sensibility to light touch is first affected. In slight cases the affected area may be one of subjective change only; the patient may be able to delimit it, but the change is not sufficiently well pronounced to enable it to be marked out by examination with cotton wool. In cases a little more severe, sensibility to the compass test is defective, although the patient may be able to recognize touches with cotton wool over the whole of the affected area. In the usual type of case the area of loss of sensibility to light touch is as extensive and as well defined as after complete division. In some cases sensibility to prick is also lost.

The fibres subserving sensibility in a peripheral nerve have been divided by Dr. Head and myself² into three groups.

1. Those subserving sensibility to light touch, enabling small differences of temperature (called minor degrees) to be discriminated, two points to be localized (tested by means of the

¹ Erasmus Wilson Lectures, *Lancet*, March 31, 1906, "Injuries of Nerves and their Treatment," p. 40.

² Head & Sherren, *Brain*, vol. xxviii, 1905. Sherren, Erasmus Wilson Lectures, *Lancet*, March 31, 1906.

compass test) and differences in size appreciated (acuæsthesia). To these we gave the name of *epicritic*.

2. Those subserving sensibility to cutaneous pain, such as is produced by pricking, the extremes of temperature or the painful faradic current. To these we gave the name of *protopathic*. All stimuli to which this system is capable of reacting produce a diffuse, radiating, unpleasant sensation. This system has much to do with "trophic" control.

3. Those reacting to the stimulus of pressure. To this form of sensibility we gave the name of *deep*. By this system pressure and its gradual increase is recognized and localized, also the pain produced by excessive pressure. Through this system the extent and direction of active and passive movements are recognized.

The properties of these three groups may be tabulated as follows:

Epicritic sensibility.—Light touches with cotton wool. Minor degrees of temperature (water between about 25° C. to 40° C.). Localization tested by compasses. Acuæsthesia.

Protopathic sensibility.—Cutaneous pain such as is produced by a prick or interrupted current. Temperature below 20° C. and above 40° C.

Deep sensibility.—Pressure and its localization. The pain of excessive pressure. Active and passive position and movement.

In a lesion of the spinal cord we have to consider not only the effect of destruction or interference with the functions of the segment or segments injured and of the fibres entering and leaving them, but also the interference with conduction of impulses up and down the cord.

When the spinal cord is injured the resulting disturbance of motion and sensibility differs very considerably from that seen after a peripheral nerve injury; the affected muscles have a different grouping and the nature of the sensory change is entirely different.

A lower segment lesion produces a flaccid paralysis of the affected muscles accompanied by changes in their electrical reactions, and, if complete, the establishment of the reaction of degeneration. It should be remembered that the motor neurone may be affected at the anterior horn cells, anterior root or peripheral

nerve. In all these situations motion may be affected without sensibility; in isolated lesions of anterior horn cells or anterior roots, motion is invariably affected alone, but when the injury involves a nerve, changes in sensibility are usually present.

The grouping of the affected muscles may at once denote the level of the lesion. For example, the deformity of the hand produced by a lesion of the ulnar nerve differs from the true claw-hand produced by a lesion of the first dorsal root or segment. In the same way, paralysis of the extensors of the fingers and the ulnar extensor of the wrist, the supinator longus and radial extensors being unaffected, at once reveals the central position of the injury. But the Erb-Duchenne or the peroneal group of muscles may suffer as the result of an injury of the spinal cord or of a nerve. In the case of Erb-Duchenne paralysis the diagnosis must in many cases rest entirely on the history, for even section of the fifth cervical anterior primary division, the nerve supplying this group, does not produce any sensory loss. When the peroneal group is affected, the tibialis anticus often escapes if the lesion is in the cord, and in this case there is no loss or alteration of sensibility, an impossibility if the motor affection were due to a peripheral cause.

It is impossible to diagnose by symptoms alone between an isolated lesion of anterior horn cells and one of anterior roots. The necessity for such a diagnosis does not often arise; when it does the correct seat is usually indicated by the history.

Injury to anterior roots occurs principally in the cauda equina; localized destruction of anterior horn cells may occur in the cervical region as the result of a traumatic hemorrhage. The term anterior root should always be limited strictly to its anatomical meaning, and not used loosely, as is so often the case, to denote anterior primary divisions.

Paralysis, the result of upper segment lesions, is easily distinguished by the electrical reactions of the affected muscles remaining unchanged, and in some cases by the spasticity and increased deep reflexes.

It was shown by Rivers, Head and myself³ that the afferent

³ *Brain*, vol. xxviii, 1905.

impulses are grouped in an entirely different manner when the spinal cord is reached. The tracts in the spinal cord are devoted to the conduction of impulses concerned with pain, heat, cold and touch; it is no longer a question of epicritic, protopathic and deep sensibility. This subject has been fully worked out by Head and Thompson.⁴ The alteration of sensibility which occurs in lesions of the spinal cord may be summarized as follows:

Pain.—After the division of a peripheral nerve or of posterior roots, those parts only become insensitive to the pain of deep pressure which are at the same time insensitive to the tactile element of the stimulus. Unless all deep sensibility be abolished pain will be caused by excessive pressure. *But if the lesion lies within the spinal cord, sensibility to pain is abolished as a whole whatever the form of the stimulation.*

Temperature.—When the lesion is within the spinal cord sensibility to heat may be abolished without sensibility to cold. When sensibility to heat is abolished in consequence of an intramedullary lesion, the patient no longer appreciates any warm or hot stimulus; in the same way, when sensibility to cold is abolished, the patient no longer appreciates any cold or cool stimulus. All distinction between the minor and the extreme degrees of temperature is lost; *appreciation of heat or of cold is lost as a whole.* The patient may be insensitive to all forms of heat and cold, and yet be able to appreciate the lightest touch and discriminate the points of a pair of compasses, conditions which can never occur from a lesion of a peripheral nerve only.

Superficial and Deep Touch.—After division of a nerve or posterior roots, light touches with cotton wool are usually not appreciated, though deep touch and pressure evoke a response. But when the lesion is intramedullary, touch both superficial and deep, is usually unaffected, although the patient may be unable to appreciate pain, heat and cold. *If affected, both forms are lost together.*

Passive Movement and Position.—After division of peripheral

⁴ *Brain*, vol. xxix, 1906, p. 538.

nerves, the recognition of passive movement and of the position into which any part of the limb has been placed is associated with the integrity of deep sensibility. But with an intramedullary lesion, it is entirely dissociated. The patient may be able to appreciate passive position and movement although totally insensitive to every other sensory stimulus or vice versa. In a similar way a patient may be able to appreciate all varieties of touch perfectly, and yet be unable to discriminate two points (compass test). In lesions of peripheral nerves the compass test is always affected with light touch.

We thus see that a re-arrangement of impulses takes place when the spinal cord is reached, and that their interruption causes loss of sensibility to pain, heat, cold or tactile sensibility as a whole, instead of to epicritic, protopathic and perhaps deep sensibility as occurs when the continuity of a peripheral nerve is interrupted. Briefly, the more important clinical points are as follows:

After division of peripheral nerves or of posterior roots there may be loss of epicritic, protopathic and deep sensibility. After division of a peripheral nerve, the loss of epicritic sensibility is of greater extent than the loss of protopathic; after division of posterior roots, the loss of protopathic sensibility exceeds in extent the loss of epicritic.

But when the injury affects the spinal cord, pain, temperature and tactile sensibility may be affected separately. Usually light touch and deep touch are well recognized although sensibility to pain and temperature are absent. In unilateral lesions of the spinal cord, the appreciation of pain, heat and cold is absent on the side opposed to the lesion, of passive movement and position, on the side of the lesion and the motor affection.

The differential diagnosis has not infrequently to be made in the upper limb after an accident involving excessive bending of the column. It has too long been the custom to consider an injury to the cervical portion of the cord as almost of necessity fatal. But a fracture of the cervical spine is by no means rare in which no suggestive symptoms are present immediately after the accident; in some of these, advice is sought later on account of the deformity; several such have come under my observation.

Mr. Hutchinson, Sr., as far back as 1866 described in the London Hospital reports, examples of injury to the cervical spine associated with nervous lesions in which the spinal injury was overlooked at the time of the accident. He considered the nerve lesion, in the light of the knowledge at his disposal, to be due to involvement of roots rather than the cord itself. We owe the revelation of the true nature of these lesions, as they occur in the cord, to the work of Thorburn and Page. The former pointed out that the injury to the cord consisted of hemorrhage into the gray matter, especially at the bases of the anterior horns, and considered that it might occur without fracture. In four out of five cases of this nature which I have seen, no bony change was detected at the time of the accident, but X-ray examination revealed a fracture of a lamina. I believe that this occurs in most instances.

Cases such as these are still overlooked by observers skilled in other branches of surgery. The possibility of fracture must be ever before one in dealing with injuries of the neck. Suspected "plexus" lesions which are bilateral should at once suggest the spinal cord as the seat of the injury. The following is a good example of a case of this type:

"A man of 54 was admitted to the London Hospital, 8 cwt. of metal having fallen from a trolley on to his head and neck. He was unconscious for two or three minutes, but was able to walk into the hospital from an ambulance. He complained of pain shooting down the outer sides of both arms, and of pins-and-needles in the hands. At first it was considered that the condition was due to a lesion of the brachial plexus. I was asked to see him fourteen days after the accident. In the right arm, the only muscles acting were the deltoid, biceps, brachialis anticus, supinators and the radial extensors of the wrist; on the left side the intrinsic muscles of hand were paralyzed. On examining his cervical region it at once became evident that there had been a severe injury here, although it was impossible to say definitely what it had been. I suspected a fracture, and this the X-rays showed to be correct. It was in the usual situation, in the sixth cervical vertebra, and was of the crushing type. The right pupil was larger than the left and did not dilate when shaded. Sensibility, even to the

compass test, was perfect, and he was able to localize the points of a pair of compasses at 1 cm. apart, everywhere. There was no marked interference with the function of the parts below the level of the lesion, but in the right leg the reflexes were increased and Babinski's sign was present. He has now (five months after the accident) recovered almost completely; he walks perfectly, and all paralysis has disappeared, but the intrinsic muscles of the right hand are still wasted."

This case brings out the points well. The grouping of the affected muscles was such as could not occur as the result of peripheral nerve injury. Again, the widespread muscular affection, with perfect appreciation of the compass test is only possible when the central nervous system is involved. In most cases the signs of interference with the functions of the cord below the level of the lesion are more marked, and some permanent disability remains. The following is a typical case of this nature:

"J. M., aged 41, came to my out-patient department at the London Hospital in December, 1906, on account of abdominal pain. Noticing that his interossei muscles were wasted, I questioned him, and found that twenty years previously he had struck his head while diving into shallow water. He lost power in his limbs at once but did not lose consciousness. Power returned slowly to all except the left hand. The intrinsic muscles of the left hand were wasted and, except the abductor and opponens pollicis muscles, were paralyzed and gave the reaction of degeneration. No other muscles of the upper limb were affected, but the left leg was weak and dragged a little in walking. The deep reflexes were exaggerated and Babinski's sign present. He was aware of no sensory change, and careful testing revealed none on the side of the lesion. On the side opposite to the motor affection he was analgesic and was insensitive to heat and to cold from just below the costal margin downwards. Tactile sensibility, deep and light, was perfect, as was localization."

Cases such as these illustrate well the points I have already mentioned. There may be destruction of a portion of the anterior horn, consequently some muscles, usually the intrinsic of the hand, remain permanently paralyzed, and may show the reaction of

degeneration. The muscles on the same side below the seat of the lesion are more or less spastic with increased reflexes. Sensibility is usually lost to pain, heat and cold on the opposite side of the body below the level of the lesion. Of this the patient is often unaware until his attention is drawn to it by accident or testing. It must be borne in mind that signs of interference with the cervical sympathetic may be present, the pupillary fibres being interrupted in the cord as they are descending from their centre in the medulla, as in the case quoted on page 253.

No difficulty should arise in the diagnosis of these cases if their existence is remembered.

We must now pass quickly to the injuries of the cauda equina, and it will be necessary first to remind you of a few anatomical points in connection with it, then to discuss the nature of injuries to which it is liable and the symptoms produced by them; we shall then be in a position to study the differential diagnosis.

The spinal cord terminates in the adult at the level of the lower border of the first lumbar vertebra. Below the level of the twelfth dorsal vertebra the name *conus medullaris* is given to it; anatomically this portion of the cord is defined as that below the level of the origin of the third sacral roots. The lumbar and sacral nerves arise close together, and their roots run downwards inside the dura mater, forming the cauda equina. The posterior root ganglia are situated outside the dura mater, so that in injuries of the cauda we are dealing with injuries to posterior and anterior roots.

Injuries to the cauda equina result most often from a fracture-dislocation in the lumbar region, and the nerves may be injured alone or in association with the conus. In lesions below the level of the first lumbar vertebra, the injuries will in most cases affect the cauda alone, and spare the conus. Up to the eleventh dorsal vertebra it may be possible to injure the cauda alone, but as a rule the conus also is involved. Injury to the cauda alone or in association with the conus occasionally follows a fall on the back or buttocks without there being any evidence of bone injury. Two such cases have recently been under my care and several have been recorded.

The symptoms produced in injuries of the cauda equina vary

with the extent and degree of the injury. When the injury is incomplete, as first pointed out by Thorburn, the nerves affected are usually lower in the series than those spared, for example, interference with the functions of the bladder and rectum, and alteration of sensibility over an area on the buttocks, corresponding to the supply of the third sacral root and those below it, is present in practically all cases. The same changes in the electrical reactions of the affected muscles occur as after injuries of peripheral nerves of a corresponding severity. The sensory loss is of the root type, that is, the area of loss of sensibility of light touch is smaller than the area of loss of cutaneous pain. Deep touch is affected only when the lesion is widespread and then to a less extent than protopathic sensibility. The following case illustrates a typical injury of the cauda equina, due to a fracture-dislocation of the second lumbar vertebra:

"A. P., a ship's carpenter, aged 27, fell 40 feet into a ship's hold, alighting on his back. On regaining consciousness he found that his legs were paralyzed. He was kept in bed for six weeks; during the whole of this time retention of urine and incontinence of feces were present, and these symptoms did not improve for three months. At this time he began to regain the use of his legs, and when I saw him first, six months after the accident, he could walk with the aid of a stick, had perfect control of his urine and feces, and had regained sexual power. Bony deformity was present in the region of the second and third lumbar vertebræ. The muscles of both lower limbs were wasted, the right more so than the left. All the muscles of the left leg acted and reacted normally to electrical stimulation. The right foot was in the position of talipes equino varus; the extensors of the toes and the peronei muscles were paralyzed, and gave the reaction of degeneration, but the tibialis anticus was acting and possessed normal electrical reactions. Sensation was altered and showed the characteristic symptoms of root injury. On the right side all the root areas from the fifth lumbar downwards were affected; on the left side a portion of the second sacral area and those below it. I advised laminectomy, but the patient would not consent so I performed complete peripheral anastomosis of the external to the internal popliteal nerve. This operation entirely changed the character of

the loss of sensibility in the external popliteal area. From being of the root type, with a larger area of loss of prick than of light touch, it became a typical area of loss of sensibility due to a peripheral nerve division with loss of light touch greater than the loss of prick."

This case illustrates the usual result of an injury to the cauda equina from a fracture of the lumbar vertebræ. At first complete paralysis of the legs, later clearing somewhat, and leaving permanent disability. When the lesion is complete, the muscles of the anterior surface of the thigh and the adductors escape, and there is a sensitive strip on the inner side of the leg, and the anterior, internal and external aspects of the thigh retain their sensibility, but the distribution of the loss of motion and sensibility is usually, as in this case, asymmetrical. The conus medullaris may be injured alone or in association with the nerves of the cauda equina. When injured alone, paralysis of the bladder and rectum results with a small patch of alteration of sensibility over the coccyx. When a larger area of loss is present, we must assume that the cauda is injured in addition.

In making the diagnosis, the extent of the lesion (the segments or roots involved) and its degree, whether complete or incomplete, must be settled, and its position, whether cord, cauda or both. To make the diagnosis of the seat of the lesion and the roots involved, it will be necessary to remember roughly the distribution, sensory and motor, of the roots composing it. From the sensory standpoint the landmark to remember is that the saddle-shaped area of loss of sensibility over the buttocks corresponds to the third sacral root and those below it; from the motor, that the muscles supplied by the external popliteal nerve (with the exception of the tibialis anticus) correspond to the fifth lumbar root. No difficulty should be experienced in diagnosing a pure lesion of the cauda. The paralysis is of the peripheral type with segmental distribution. The sensory loss has the characteristic features of an injury to the posterior roots. Most of the lesions are incomplete. With such a lesion of the spinal cord, light touch would be everywhere appreciated, although sensibility to prick might be lost. Considerable difficulty may arise in the diagnosis of a lesion of the conus from one of the lower sacral roots. A pure conus injury should give rise to little difficulty:

paralysis of the bladder and rectum with a small area of sensory change over the coccyx. It is when the two are combined that it may be absolutely impossible to make the diagnosis, except by exploration or the progress of the case. The following points are to be kept in mind. The distribution of the paralysis; the nature of the sensory loss, if cauda, it has root characteristics. Asymmetry is suggestive of cauda equina.

A careful examination of the results of injuries in the cervical and lumbosacral regions will lead to the correct diagnosis being made, if the points of difference in the alterations in sensibility and the motor affection be remembered.

Ophthalmology

AN UNUSUAL CASE OF CONGENITAL SQUINT *

BY WM. CAMPBELL POSEY, M.D.

of Philadelphia

H. S., aet. 14 years, was brought to the service of the writer at the Wills Eye Hospital one month ago, for the correction of an internal squint in the left eye, which had been present since early infancy. It was ascertained that the birth of the patient had been unattended with difficulty, forceps not having been applied. There was also no history of strabismus or of other ocular anomaly in the family.

Examination showed the face to be asymmetrical, the lower part being markedly underdeveloped, the chin being small and receding. The left orbit appeared broader than its fellow and the corresponding side of the face was flattened. The palpebral fissures were obliquely placed, both external angles being directed down and out. The arch of the palate was high but the teeth of both jaws were all present and regular.

Both eyes appeared of equal size. The right pupil was 3 mm. in size, the left 4 mm. Both irides reacted well to light and accommodation stimuli. O. D. V. equalled 6/5; O. S. V. but finger counting at 1 m. H. equalled 1 D. in each eye. There were no changes in the fundi.

When fixing, the left side of face presented and both eyes were focused upon the fixing object. When the head was brought into the primary position, however, and the patient asked to fix, the right eye alone fixed, the left deviating somewhat downward and outward. When the fixing object was carried to the left, the left eye fixed, and the right shot up and in, due to an overaction of the right inferior oblique. When, on the other hand, the examining

* Read before the Ophthalmological Section of the College of Physicians of Philadelphia, April 16, 1908.

object was carried to the right, the right eye fixed, and the left shot up and in, the upward and inward deviation being more pronounced than that observed in the right eye when the eyes were directed to the left.

In left monocular fixation, it was noted that inward motion in the median line was abolished, that upward and inward motion was poor, while downward and inward motion was well conserved. Motion directly upward was excessive, while straight downward motion was limited; downward and outward motion, as well as outward motion in the median line were normal. In monocular fixation of the right eye, all the movements of the eye appeared to be normal. Movements of the jaw had no influence upon the ocular excursions or movements of the lids.

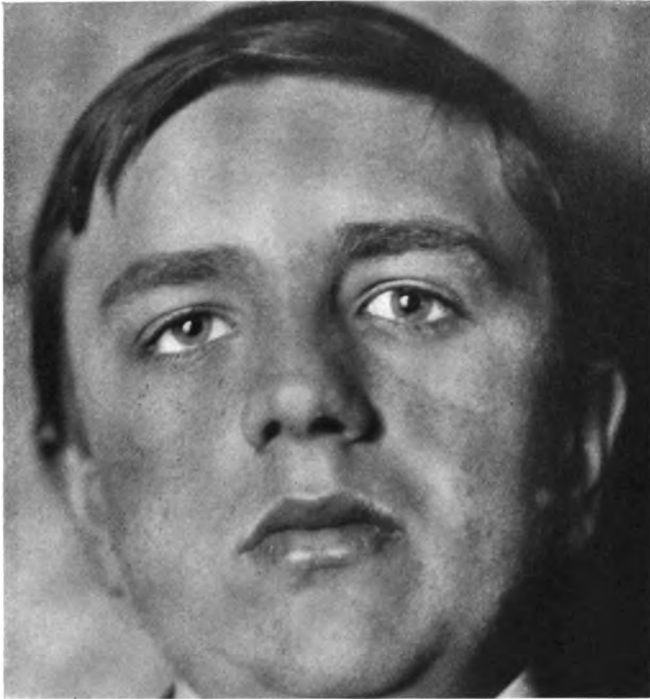
The writer was aided in the study of the case by his colleagues Drs. Schwenk and Zentmayer, and it was thought that the limitations of movement in the left eye were best explained by complete absence of function in the left internal and superior rectus muscles, and by a partial loss in the inferior rectus muscle. Advancement of the left superior rectus muscle was advised, with a view to bringing the left eye into normal position in primary fixation, other procedures to be resorted to later, after the eyes had adapted themselves to the changes effected by the advancement.

The particular grouping of the muscular insufficiencies exhibited in this case has never before been encountered by the writer, the deviations differing from any of those observed in the 70 cases of congenital squint which were reported by him before the Ophthalmological Section of the A. M. A. last year.

The deviations in the case under discussion may be explained perhaps either by a partial palsy of the left third nerve as a consequence of pressure in its passage through an abnormally small orbital fissure in the imperfectly developed skull, or to structural anomalies in the muscles themselves, with perhaps the formation of fibrous bands, as has been discovered in other not very dissimilar cases.

The writer has so recently elaborated the entire subject of congenital squint, that further comment upon this particular case will be avoided, these short notes being published merely for the purpose of calling attention to another type of deviations which may be assumed by congenital cases.

FIG. 1.



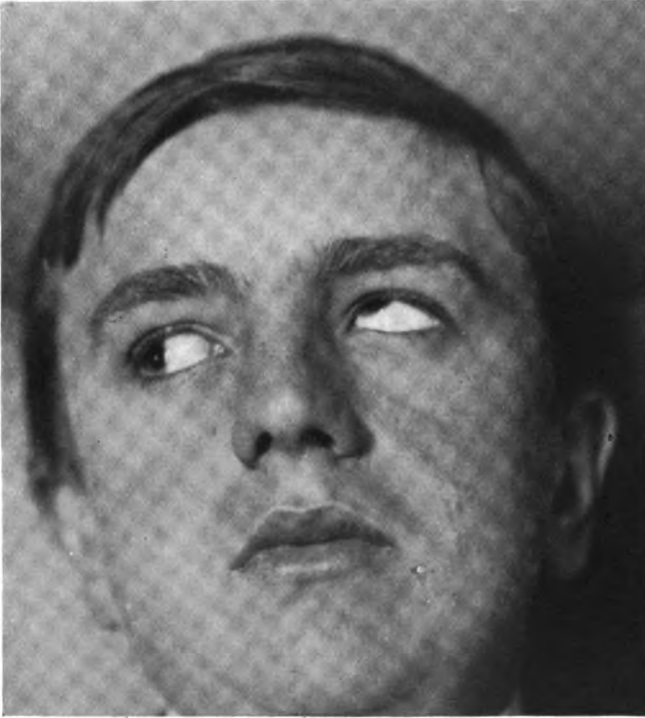
Patient fixing in median line, somewhat above horizontal plane. Right eye fixing, the left deviating slightly downwards and outwards. Palpebral fissure obliquely placed. Lower part of face underdeveloped.

FIG. 2.



Looking to extreme left. Left eye fixing, right deviated up and in. Overaction of right inferior oblique, secondary to faulty action in left superior rectus muscle.

FIG. 3.



Looking to extreme right. Right eye fixing, left eye deviated up and in by overaction of left interior oblique; the left internal and superior and inferior recti muscles being paretic.

FIG. 4.



Looking to the extreme right and somewhat up. Right eye fixing. Left eye deviated far upward in median line.

ON THE TREATMENT OF TRAUMATIC PERFORATION OF THE CORNEA

BY CHARLES DELOPÉ, M.D.

Assistant in Ophthalmology to the Paris Hospitals

ACCIDENTAL perforation of the cornea by a foreign body is a common and serious accident that requires immediate care, as the slightest delay may cause irreparable damage. A great variety of objects can perforate the cornea, provided they are sufficiently pointed and strike with enough force of penetration, as for instance fragments of stone or metal, shot, pointed steel instruments, etc.

At the moment when the accident occurs the patient usually feels violent pain. Instinctively he carries his hand to his eye, which he immediately closes, and presents himself for examination in that posture.

The lids may be normal, but the lashes are stuck together by the abundant lachrymal secretion. When the physician learns what has occurred, he immediately thinks of the possibility of perforation, and this possibility calls for the greatest prudence as well as gentleness on his part. Even before washing the lashes with a sterilized warm solution he should examine the tonus of the eye; asking the patient to look downward he should press lightly and alternately with the two forefingers on the upper portion of the eyeball, which, when there is perforation, loses its resistance and becomes flabby, a sign of the greatest importance. The surgeon should then gently wash the lids and separate them with every precaution. This step is generally followed by a rush of tears. He should not throw light too suddenly into the eye, lest thereby he give rise to some sudden movement on the part of the patient.

In these conditions the wound can be examined with all the thoroughness desirable. With one hand the lids can be kept apart, by resting the fingers above and below on the edge of the orbit in

order not to press on the eyeball; while the other handles a convex lens of twelve to fifteen diopters whereby the eye can be suitably lighted up.

After having seen that the anterior chamber is effaced, attention should be directed to the wound itself, in order to ascertain its extent; whether it is in the central portion or edges of the cornea, whether there is hernia of the iris or merely adhesion of that membrane to the wound, whether the edges of the perforation are smooth or jagged, whether there are several wounds, and whether the perforation has affected the ciliary region. All of these details can be most readily noted by comparison with the sound eye. It is next desirable to know whether the foreign body is still in the eye, in which case it is almost always in the lower half through the action of gravity, though it may be hidden from sight by the slight effusion of blood that is always present if the iris has been wounded. Still, the examination of the patient and history of the case usually suffice for a diagnosis, without there being any necessity to have recourse to more complicated methods.

The coloration of the pupil is of considerable value; a milky tint often indicates a wound of the crystalline lens, or traumatic cataract. The patient's sensitiveness to light must also be tested; he should be told to cover his sound eye with his hand and to look at a fixed point with the other, onto which the physician should then throw a moderate light. When the deeper membranes have not been wounded, sensitiveness to light from any side should be intact, and the patient should indicate direction without any hesitation. Whenever possible the acuity of sight should be exactly noted for both eyes. The tear apparatus should also be explored, as these wounds are particularly serious and of bad prognosis when there is any neighboring infection.

Such is the habitual appearance of a traumatic perforation of the cornea at the moment of the accident. But unless serious infection and complications occur, the wound will quickly close up, if it is clean-cut, and the anterior chamber and tonus will become normal again. The perforation, so easy to see at the first, leaves behind only a very small white scar, and a retrospective diagnosis ultimately becomes very difficult.

The prognosis of an accident of this sort is subject to a variety of contingencies, and its relative benignity or gravity depends as well on the wound as on the patient.

The first and great danger of such a wound is infection, which may spread to the neighboring tissues and give rise to panophthalmia. Some foreign bodies may be looked upon as aseptic, as for instance, a grain of shot from a hunting gun if it reaches the eye directly without striking other things; metallic fragments are also frequently aseptic, thanks to the degree of heat to which they are being subjected at the time of the accident. Still, foreign bodies may, even when aseptic, have a disastrous effect on the eye through the corrosive action due to their chemical composition.

It is possible therefore to derive some elements of prognosis from the nature of the foreign body, and the examination of the wound will supply others; thus an extended wound with jagged edges is less likely to heal up well than a small and clean-cut wound, and is more likely to become infected. Adhesion of the iris to the wound of the cornea (adherent leucoma), or hernia of the iris, retard recovery, and may in the future give rise to the serious condition known as glaucoma. If the wound is a central one it leaves a scar or spot which lessens the power of vision of the eye to a varying extent. When farther out towards the circumference, and affecting the ciliary body, the wound is more serious still, as it may give rise to sympathetic ophthalmia in the other eye. In all these cases and with very few exceptions the wound is followed by an altered curve of the cornea which becomes irregular, so that in spite of glasses the power of sight is considerably less than before the accident.

When the lens is affected, the abnormal vision which may result in that eye, if it has to be operated on for cataract and the patient has afterwards to wear a heavy convex lens, must be carefully born in mind. Under these conditions the difference in sight between the two eyes is such that we are not always able to restore binocular vision. Finally, the deeper membranes may have suffered, the future of the eye may be badly compromised, if not altogether lost, so that the most minute examination is necessary in these cases to ascertain the exact extent of the trouble.

The condition of the patient is an equally important factor in

his recovery. I have already mentioned the danger to a wounded eye from neighboring infection: dacryocystitis, acute or chronic conjunctivitis, blepharitis, nasal trouble, etc. But the patient's general constitution also plays a part in the good or bad course that the wound will follow, according to the case. For instance, a person presents traumatic perforation of the cornea; the wound appears to be in the best condition possible and to be one of those that ought to get well rapidly; but the patient is tuberculous. Under these conditions the wound constitutes a weak point, and may give rise to local tubercular development, although such a complication is happily rare.

Finally, the age of the patient should not be overlooked. In a general way old people, with their diminished vitality, recover slowly; on the other hand, we have in many instances noticed in children the relative harmlessness of accidents concerning which at the start the prognosis had seemed very unfavorable.

It is not our intention here to describe the treatment of the different accidents resulting from perforation of the cornea; we will limit ourselves to pointing out the immediate attention necessitated by the wound, and to a few practical suggestions.

Our first duty is to cocainize the eyes, so that the patient need not suffer. This can be accomplished with a few drops of a three per cent. solution of cocaine. It then becomes relatively easy to clean the wound thoroughly and to disinfect it as far as possible by means of the following warm solution:

Cyanide of mercury	0.05 cg.
Distilled water	500.00 Gm.

When there is hernia of the iris, iridectomy is necessary even if the eye is inflamed; the section of the projecting iris must be a deep one, otherwise there is risk of replacing in the eye a contaminated portion.

Any neighboring infection must be vigorously treated from the very outset.

The nature and composition of the foreign body must then be ascertained with care. Fragments of iron, steel, and copper have more or less chemical action on the eye; other metals such as gold,

and substances such as glass, stone or wood, only act through the infectious elements they may bring with them into the wound. On the other hand, iron and steel are magnetic elements, so that we have thus, from a therapeutic point of view, two very distinct classes of foreign bodies: those that are affected by the magnet, and those that are not.

A non-magnetic foreign body may be visible and may still be in the anterior chamber; it should then be removed and if the wound is not large enough, the latter should be extended, or else another incision made to allow the forceps to pass. After extraction, with or without iridectomy, a little iodoform salve should be applied under a dressing.

If the foreign body has penetrated deeply and cannot be seen, the physician's action must depend on circumstances. If it is small and aseptic it may be tolerated by the eye for a long time without compromising sight; there is no necessity of immediate action, beyond careful disinfection, antiseptic salve, and a dressing. The physician can then await events; the wound may heal, but careful supervision is necessary for some time, as inflammation is always possible. At the slightest irritation the greatest care must be taken, and if the treatment does not subdue the trouble at once, it is preferable to enucleate a wounded and painful eye than to run the risk of losing both the diseased and healthy eye through sympathetic ophthalmia. This is also the case when the pressure in the eye increases and there are signs of glaucoma.

A fragment of copper, when it cannot be removed, makes enucleation necessary, since it cannot be extracted with the magnet and it gives rise to anatomical trouble through pressure alone.

As to magnetic bodies, they must be removed in all cases. This extraction is relatively easy if the foreign body is still in the anterior chamber. The best method is first to ascertain its exact position and then to make an incision of the cornea and to insert the sterilized point of Hirshberg's electro-magnet. But when it is deeply placed all operators agree that the use of the little electro-magnet is dangerous and almost always insufficient; it is best when possible to have recourse to Haab's large magnet, which is of sufficient strength to extract fragments from the inside of the eye without risk of infection. The great drawback to this

instrument is its cost, and the strength of current necessary to work it; when the instrument cannot be had, enucleation is imperative whenever the magnetic foreign body cannot be removed.

Every wound of the eye must be carefully protected, and the use of a five per cent. iodoform salve in vaseline can be highly recommended. Infection of the conjunctiva can also be prevented by the use, morning and evening, of two drops of a wash prepared with a five per cent. solution of collargol in water.

The eye should always be covered with an occlusive dressing. General treatment should of course be combined with the local care. Rest in bed will hasten cicatrization; and any diathesis should be counteracted by appropriate means.

Later on, the wound in the cornea may leave a spot, and the more central and extensive the spot the greater will be the diminution in sight. Efforts can be made to lessen the extent of the scar by prescribing daily massage with a salve of yellow oxide of mercury in vaseline (one per cent.); but in spite of everything, iridectomy may become necessary. The astigmatism will have to be treated by appropriate glasses. The decrease in sight in the wounded eye may disturb binocular vision, and result in more or less strabismus that will have to be remedied by means of suitable exercises.

The French law of 1898, concerning accidents among workmen puts the physician in a very delicate position. His opinion may be asked at the time of the accident, somewhat later, or when the trouble has reached a point at which no further improvement seems possible; the latter certificate, demanded by the courts, is the most important. It requires that the physician should go into all the details concerning the wound, as well as the date of recovery. The examination should be very complete, and no part of the eye should be omitted; the physician must always be on his guard, as it is to the patient's interest to simulate. The danger that the physician must always bear in mind is the possibility of sympathetic ophthalmia; now we know that this accident may occur a long time afterwards,—five, ten, and even twenty years. In this connection a recent work on ophthalmology gives the following: "When the physician is called upon to give his final opinion, that is, not before six months at least have elapsed since the accident, if there

is no ciliary reaction in the eye, and no pain on pressure, the risk of sympathetic ophthalmia can for practical purposes be looked on as over; but if the eye remains slightly injected, painful to pressure, tearful and averse to light, it is advisable to be extremely prudent, and to recommend enucleation, which is the only means of preventing accidents."

The expert must estimate the incapacity caused by the accident: partial permanent incapacity, or total permanent incapacity, and state the value of this diminution of work-capacity. He should bear in mind in this connection that French law does not take into account the intrinsic harm resulting from an accident, but only the reduction in professional capacity; now as professional visual acuity varies with each trade, the physician will have to be guided by the Tarifs that have been laid down up to the present time.

The averages that have so far been settled are the following:

Loss of one eye: 25, 33, and even 40 per cent. in certain professions. Loss of one eye when the sight of the other was already defective: 75 per cent. Loss of one eye and partial loss of sight in the other: 59 to 80 per cent. (This will have to depend, naturally, on the degree of sight left in the second eye.) Loss of both eyes, or loss of one eye, the other being already blind: 100 per cent. Various lesions producing a certain diminution of sight in one of the two eyes: 10 to 33 per cent.

ON LEUKÆMIC RETINITIS

BY ANDRE ROCHON-DUVIGNEAUD, M.D.

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HEMORRHAGE of the retina is a fairly common occurrence. We know very well in what instances this accident takes place, and that it is a complication of diabetes, nephritis, arteriosclerosis, pernicious anæmia and leukæmia; but we are practically ignorant of its pathogenesis, that is, of the mechanism (though no doubt there are many factors) which gives rise to it during the course of the above-mentioned diseases. Is it due to the general or local tension of the blood, to vascular lesions, or to the condition of the blood itself?—these are points which still have to be settled for each case of hemorrhagic retinitis.

We should then really understand the significance of these lesions, concerning which our knowledge is still rudimentary and purely clinical. Although we know, for instance, that the prognosis of nephritic retinitis is as a rule very grave, we do not at all know why such is the case. The symptom, hemorrhage of the retina, will only attain its true place in medicine when we shall have found out the degree to which blood tension, local circulatory disorders, vascular changes and lesions of the blood itself, contribute to its production. In this connection I may remark that the hematological study of hemorrhagic retinitis, whereby is meant the condition of the blood in patients with hemorrhage of the retina, has so far been practically neglected; research has rather been directed towards the condition of the vascular walls, of which the examination by means of the ophthalmoscope is only macroscopic, and has consequently only a very limited clinical value. It is only under the microscope, and consequently post mortem, that the real condition of the vessels can be ascertained. The study of the blood, on the other hand, is always within reach; this method has the advantage of being applicable in clinical medicine, and in some cases clears up the diagnosis, which is the basis of both prognosis and

treatment. There is here an entire field of research awaiting somebody's energy and time.

The following two cases will give a very good idea of the medical interest connected with hemorrhagic retinitis, and of the close relation that this symptom may have with alterations of the blood.

CASE I.—A young man of 38, of robust appearance though strikingly pale, noticed for the ten days that preceded my seeing him such a marked decrease in vision that although he could still get about he could no longer read even large print. The ophthalmoscope showed in the macular regions of both eyes large hemorrhagic patches that necessarily abolished central vision. There were in addition toward the periphery a few disseminated hemorrhagic patches, of which several showed a white point in their centre. The papilla and vessels were of normal appearance, the condition consisting then entirely of hemorrhage.

Such a symptom by itself does not admit of definite diagnosis; but on questioning the patient we found that he had had in the Soudan seven years previously several attacks of malaria, which, although not serious, led me to examine his spleen, which proved to be of enormous size, jutting out almost to the umbilicus. The liver was slightly hypertrophied, but nothing special was detected in the remaining organs. There was no enlargement of the lymph-nodes, but examination of the blood revealed an enormous number of leucocytes, whose characteristics I shall refer to presently, and furnished us at last with the key to the diagnosis: the case was one of myeloid leukæmia with leukæmic retinitis.

In order that the condition of this patient's blood may be fully appreciated, it may be well to recall the fact that in the normal state each cubic millimetre of blood contains from 4,500,000 to 5,000,000 red globules, all without nuclei, and 6000 to 8000 leucocytes, which latter are of different sorts, but whose nature and numerical proportions are remarkably constant in the normal state; thus, in one hundred leucocytes there are found (1) 32 to 33 mononuclears of different sizes but always characterized by homogenous protoplasm free from granulations, whatever may be the stain employed; (2) 64 to 65 polynuclears with neutrophile granulations, which are the common sort of leucocytes, that of acute sup-

uration; (3) one to two polynuclears with large eosinophile granulations; (4) 0.5 to 0.25 polynuclears with basophile granulations.

This cellular constitution of the blood is as constant as the structure of a normal tissue, whose exact equivalent as a matter of fact it is. Considered from the point of view of the leucocytes it constitutes the physiological leucocytary equilibrium, an equilibrium that can be modified by many pathological conditions, and represents, as can be easily understood, a most delicate reagent towards certain definite disorders.

Knowledge of the histology of the normal blood will now enable us to understand the modifications presented by that of our patient. The number of red globules was diminished to 3,224,400; that of the leucocytes, on the contrary, was 50 times greater than in the normal state, 362,700; furthermore, the relative proportion of the different kinds of leucocytes, and particularly the nature of these different kinds, showed definite pathological characters. But of 1000 leucocytes there were 50 mononuclears, of which only 12 per cent. showed a non-granular protoplasm, that is to say, analogous to that of ordinary mononuclears; 38 per cent. were granular, the majority with neutrophilic granulations. The latter are the *myelocytes*, cells which are found in the normal bone-marrow, some with large pale nuclei and these were frequent in our case, and the others with darker and smaller nuclei. Their presence in the blood characterizes myelogenous leukæmia, that is to say, leukæmia of medullary origin. Some writers prefer the terms of myeloid leukæmia, because in such cases it is not the marrow of the bones only that supplies the myelocytes, but also the spleen, the liver and in fact all the organs that are attacked with myelomatosis. This modification of tissue makes these organs similar to bone-marrow from the point of view of hematopoiesis.

I have laid stress on these granular myelocytes because it is their presence in the blood that stamps the complaint as myeloid leukæmia. The 50 per cent. of polynuclears subdivide as follows: 42 per cent. neutrophiles, 7 per cent. eosinophiles, and 1 per cent. basophiles; in short, the absolute number of all the leucocytes was increased, but this increase was relatively greater for the granular mononuclears, which are characteristic of the disease.

CASE II.—The second leukæmic patient was, when I first saw him, extremely weakened by epistaxis, so that he passed the greater part of his time reading the newspapers in bed; his sight, therefore, would not seem to have been weakened. Still, I examined him carefully and discovered extremely apparent and characteristic lesions. The veins of the retina were very large, prominent and sinuous, to such a degree as only occurs in leukæmia; their color was yellowish-pink, instead of the customary blackish-red. Towards the periphery some of them had become transformed into white threads, representing either leucocytic accumulations or else thromboses. In the same region the retina showed a certain number of white patches of hemorrhage surrounded by red, of which some were papular, prominent, and more or less rounded. Finally, the general color of the fundus of the eye was lighter and yellower than in the normal state, which was due undoubtedly to the lack of color of the blood. The macular regions were merely a little indistinct, but showed no hemorrhage.

In spite of these great ophthalmoscopic modifications, which betrayed rather a process of infiltration than one of destruction, and which furthermore had spared the centre of the retina, the patient was unaware of any trouble of sight. But on the other hand I discovered that the beginning of the disorder with him had taken place in the ear! Thirty years old, and without other antecedents than an attack of inflammatory rheumatism at the age of ten he had been suddenly seized a year previously with vertigo and sounds in the ear, and gradually became completely deaf. The trouble then began to amend little by little, and at the end of a few months disappeared altogether. In the meantime, however, his abdomen had increased in size and his strength diminished. A few months later the same trouble recurred in the ear, and the deafness became permanent. This was a case of leukæmic trouble of the labyrinth, in which the lesions are entirely analogous to those of retinitis: hemorrhage and thrombosis of the cavities of the internal ear. These symptoms were followed by profuse epistaxis. The spleen was enormous, measuring 31 by 21 centimetres; the liver was also very much enlarged, coming well out from beneath the ribs. There was no hypertrophy of the lymph-nodes.

Examination of the blood showed the following condition: reds

2,828,000, whites 918,000; of one hundred leucocytes there were 40 polynuclears, of which 36 were neutrophiles, and 4 eosinophiles; the mononuclears were 57, of which 43 were granular. There were, finally, 3 per cent. of nucleated red cells.

This patient's blood is therefore even more abnormal in its cellular composition than that of the former one, though its alterations are analogous and likewise characterized by a large number of granular myelocytes. The case is consequently a pure splenic form of myeloid leukæmia.

And yet the lesions of the retina in the two cases are quite different in appearance. The first is simple hemorrhagic retinitis without distinctive characters; the second is leukæmic retinitis as clearly characterized as possible. Are we to look on these as two different disorders? The first patient, who had had attacks of malaria, might be thought to have hemorrhage of the retina dependent on that complaint. This is not at all likely; hemorrhage occurs in such instances either during the attack, and with our patient the last attack had taken place six months previously, or when the patients are in a condition of malarial anæmia, which is not the case here.

But it should be remarked that the general condition of these two patients, with their different forms of retinitis, is not at all comparable, although they are suffering from the same disease. The strength of the first patient is well preserved, and with the exception of the condition of the blood all of his functions are still working normally. With the second, on the contrary, the weakness is extreme; the condition of the retina, blocked up with hemorrhage and venous thrombosis, is probably a reflection of that of many of the other organs, and the epistaxis as well as the hemorrhage of the ear are grounds for apprehending more serious complications.

In a word, these two forms of retinitis, which differ in spite of their common origin, appear to be connected with two different stages of the disease: the first, purely hemorrhagic, may perhaps be a transitory form capable of improvement; the second, clearly represents deeper alterations, more obstructed vessels of the retina, in other words a more advanced stage of the complaint, because the blood is more severely affected and has been so for a longer time.

In such cases if the leukæmia were to be cured we should certainly see the retina regain its physiological appearance little by little. It is the characteristic of this infiltration of the retina that it disappears and leaves the retina almost intact when its cause is removed. If, as certain successful cases lead us to hope, leukæmia is likely to be improved and even cured by radiotherapy, we shall certainly see all the retinas recover in which hemorrhagic infiltrations and thromboses shall not yet have determined degenerative lesions.

As regards the clinical interest of leukæmic retinitis, in view of the prognosis of the disease on which it depends, which is always serious, it has evidently not the same prognostic value as the retinitis of diseases whose gravity varies according to cases and forms. We know that the kind of nephritis that is accompanied by retinitis is almost always fatal within a time that hardly exceeds two years; whereas cases where the retina is not affected are usually apt to be less serious. With leukæmic patients the most that can be hoped for would be that the retina should give indications as to the probable length of time the patient had to live. I once saw a child of eight who had leukæmic retinitis quite similar to that of our second case. He died a few days later. It is probable that with him the retinitis had already existed for some time.

Now as to the mechanism through which the leukæmic retinitis develops, it is manifestly difficult to deny *a priori* that the lesions of the blood are the cause of it. The question has been raised whether the large leucocytes that are present in such abundance in the blood in leukæmia are able to pass freely through the capillaries. The capillaries of the retina have been found to be blocked and swelled out by agglomeration of leucocytes to such an extent that they seemed as if aneurysmal dilatations had formed. One case has been reported in which the venous circulation of the retina had become so sluggish that with the ophthalmoscope a centripetal current of granulations could be made out. It is difficult not to think that in that instance there was a thick layer of leucocytes flowing relatively slowly along the venous walls. This is a case then in which there was manifest circulatory decrease in speed due to a certain degree of viscosity of the leukæmic blood and capable of ending in leucocytic stasis. It is noticeable that leukæmic hemorrhage occurs at points

where there are no vessels visible to the ophthalmoscope, that is to say, among the capillaries, where pressure is low and blocking can easily take place; furthermore, leucocytic stases occur at the very point of origin of the veins, a region where the *vis-a-tergo* is weak and the calibre of the vessels sufficiently narrow for the large leucocytes to accumulate there easily.

The mechanical phenomena of leukæmic retinitis appear to be analogous to those that take place in an artificial injection with a badly filtered liquid containing particles that accumulate in the capillaries and cause them to burst. The great number of leucocytes in the blood, and the abundance of big globules, seem, therefore, to be the essential factor in leukæmic hemorrhage; and if this be true, the study of the blood gives us information both concerning the cause and the pathogenesis of the retinitis.

This does not mean that every occurrence of hemorrhage of the retina in the course of the different general disorders has a similar explanation; but nevertheless the condition of the blood is one of the factors to be looked into by anyone interested in the difficult study of the pathogenesis of these forms of retinitis.

Whether or not hemorrhage occurs in the retina more easily than in the internal viscera it is difficult to say. The eye is, however, the only organ in which we can observe hemorrhages measuring no more than a few hundredths of a millimetre, and in which we can even distinguish peculiarities in the nature of these hemorrhages. In albuminuric retinitis, for instance, we often see more white spots than red, that is to say, more fibrin poured out into the tissue of the retina than red globules. We shall no doubt some day ascertain the meaning of a hemorrhage of this nature. It may be due to a special condition of the blood, or to vascular alterations of a peculiar kind. Everything, in a word, indicates that the study of the blood in retinitis should not be neglected, and that the serum should be examined, as well as the figured elements.

There is no special treatment for leukæmic retinitis. It is even unnecessary to advise the patients not to use their eyes; our second patient read several newspapers a day without tiring his sight. In view of his former attacks of malaria our first patient was put on sulphate of quinine, to which we added chloride of calcium,

hoping to prevent fresh hemorrhage. Both patients were furthermore subjected to radiotherapy.

Since that time patient No. 1 has recovered the use of his left eye so that he can read, and his general condition is still good. Patient No. 2 died without ever having any trouble with his vision. He was able to read up to his last day. On examining his retina with a magnifying glass post mortem, after enucleating and opening the eye, our diagnosis of the existence of white thrombus, or leucocytic stasis, seen with the ophthalmoscope during life, was confirmed.

Rhinology

ADENOID VEGETATIONS IN THE NASOPHARYNX

CLINICAL LECTURE DELIVERED AT THE UNIVERSITY OF LOUISVILLE,
MEDICAL DEPARTMENT

BY J. MORRISON RAY, M.D.

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GENTLEMEN:—This little boy is six years of age. His mother brings him to the clinic because of some trouble with his throat. She says the child has always been perfectly healthy, except that ever since he was born he has had some throat trouble. She has finally decided to bring the boy to us for treatment because last night he felt sick, and after a spell of vomiting, complained more than he usually does of his throat.

Your attention is first called to the fact that this child is a heavy breather and that his mouth is constantly open. The peculiar facial expression is quite characteristic of a mouth-breather. The question arises, what is the cause of the noise he makes in breathing, and why is his mouth kept constantly open? A great proportion of the laity have the idea that the nose is made only to smell with, whereas we know that it should more rightly be considered an organ of respiration than of olfaction. We might say that the nose is primarily an organ of respiration, and secondarily one of olfaction. Naturally anything which will obstruct the nasal passages will produce mouth-breathing. The obstruction may be in the nares, or it may be in the pharynx. In this case it could hardly be in the pharynx because obstruction in the pharynx would interfere with breathing through both the nose and the mouth, so we may say that ordinarily mouth-breathing is due to obstruction either in the nose or in the nasopharynx.

What are the causes of obstruction in the nasopharynx? The

most common cause is an excessive development of the normal glandular tissue found there. Situated in the roof of the nasopharynx there is a mass of lymphoid tissue that by the older anatomists was known as Lusk's tonsil. It is simply an aggregation of lymphoid tissue which in its histological make-up looks very much like the faucial tonsils.

To Meyer, of Copenhagen, is due the distinction of first calling attention to the fact that enlargement of this adenoid tissue is a frequent cause of mouth-breathing, when this symptom occurs in childhood; and he familiarized the medical profession with the condition that is now universally known as adenoid vegetations in the vault of the pharynx, or is often referred to as the third tonsil. Meyer developed the subject so thoroughly that very little knowledge has been added to the observations which he made over thirty years ago. He proved conclusively that mouth-breathing in children was in a large percentage of cases due to enlargement of this mass of lymphoid tissue found in the pharynx; he further proved that it was the cause of ninety per cent. of ear diseases in children, and that it was the starting point of the majority of cases of deafness in adult life.

You will find that a great proportion of cases of adult deafness, if you will trace the history carefully, started with nocturnal earaches in childhood, probably at first slight, then gradually increasing in severity. You will also find that these people were all mouth-breathers in childhood, a condition which remained as complete or partial after they had reached adult life. If you will examine the nasopharynx you will almost certainly find there a fibrous mass which represents the atrophied remains of the aggregation of lymphoid tissue that obtained in earlier life. Adenoids never disappear in the strict sense of the word, they atrophy just as do the faucial tonsils; they may shrink and the glandular tissue almost disappear, but you will always find present in later life a fibrous mass.

Meyer proved that by removing these obstructions to breathing in childhood, not only was the ear disease relieved, but the physical condition of the child was also much improved. He demonstrated further that a great many cases of flat chest, round shoulders, etc.,

were due to the habit of mouth-breathing. So long as the child was able to breathe through its nose it would maintain a normal condition; but as soon as it was forced to breathe through the mouth it became round shouldered, and sooner or later the condition we all know as pigeon-breast developed.

Later on a dentist called our attention to the large number of irregular teeth that were found in mouth-breathing children. In a great number of instances it has been discovered that children with irregular and decayed teeth are mouth-breathers. Again, the dentist further showed us that the majority of these irregular teeth were due to abnormal development of the superior maxillary bones, that in nine-tenths of the cases the mouth-breather had narrow arches, that is, from side to side across the roof of the mouth the distance was very much lessened, that instead of there being a normal curve to the roof of the mouth there was a very high arched hard palate giving less space for the teeth to develop and destroying the normal contour of the face. In the confirmed mouth-breather, then, we find the stooped shoulder, the sunken chest, so-called pigeon-breast, bad-teeth and deafness.

Furthermore, mouth-breathing seems, in some way, to have a very decided effect on general nutrition. The mouth-breathing child is not properly aerated, he does not get a sufficient amount of oxygen, nor does he get it in the proper way. Time and again we are called upon to remove these obstructions in the nasopharynx, not because of the local disturbance but in order to improve the general nutrition of the child and induce better physical development. Many times I have seen anæmic, poorly nourished children rapidly develop and take on flesh after removal of adenoid vegetations from the nasopharynx.

I have not yet made an examination of the child before us. However, the physiognomy is characteristic and based upon this alone one could hardly make a mistake in the diagnosis; but of course it is necessary to confirm this by an examination, and the child is brought before you for that purpose,—to outline some of the symptoms found in this condition, and to make the diagnosis.

As I have already told you, one of the most frequent causes of mouth-breathing is obstruction in the nasopharynx; so when a mouth-breathing child comes to you the first thing you should do

is to look into the mouth, the nose, and the nasopharynx. It may be, of course, that this child has some obstruction in the nose, and not in the nasopharynx. Children very rarely suffer from disease of the nose which can give rise to obstruction of the nasal passages. Sometimes children will have permanent obstruction from a rhinolith; sometimes they will have obstruction as a result of trauma; a blow on the nose may break the nasal septum and block one nostril: but as a rule when this occurs the other nostril is open, the obstruction is not complete, and under these circumstances they will be temporary but not persistent mouth-breathers. Certain growths may develop in the nose of the child: fibromata are not infrequently found in the nasopharynx; nasal polypi are uncommon in children. In my entire experience, I have seen only one or two such cases, and Morel McKenzie in his book on nose and throat diseases says that nasal polypi never occur in children under the age of ten; yet I am certain I have seen at least one case in a child younger than ten years. You can, therefore, almost eliminate any nasal cause for this obstruction in the child.

Nearly always associated with the condition known as adenoids, third tonsil, hypertrophy of the glandular tissue,—since in the child the glandular tissue is in its highest state of activity,—you will also find enlargement of the faucial tonsils so-called. In examining the throat we use an ordinary tongue depressor and head mirror in order to illuminate the child's throat. With the light on one side we gently insert the tongue depressor. Simple as it may seem, there is some little science in using the tongue depressor. A great many men in examining the throat will jab their tongue depressor far down into the throat invariably causing the patient discomfort and making him "gag." After such treatment the patient always fears the introduction of the instrument. One may readily hold down the tongue, even of a child, without making him gag or giving him any discomfort whatsoever. If when one tells the patient to open the mouth, keeping the tongue well back between the teeth, he inserts the tongue depressor, not far back in the mouth as is done by a great many men, but only about one-third of the way back, and gently presses downward and backward, at the same time encouraging the patient to make an effort to swallow, the tongue is kept well out of the way and

one may see well back into the throat. This is a point well worth remembering, and by following the plan suggested you will never gag the patient or cause him any annoyance whatever. Nine-tenths of the children we see with throat disease in this clinic are frightened when we go to use a tongue depressor because someone has been guilty of forcing such an instrument, or a spoon, far down the throat in attempting to make an examination. You will observe how easily we examine this child's throat after the manner I have described. We find that he has an enlarged faucial tonsil on either side, but we are unable to see very much of this enlargement because it does not extend far beyond the anterior pillar. While there is an enlarged mass on each side, this is not sufficient to obstruct his breathing, consequently we must look elsewhere for the cause of the obstructed breathing.

With a small speculum we will examine his nose: I find the septum seems to be almost in the median line, there is a little congestion about the anterior end of the inferior turbinate causing the meatus to be more or less blocked, the middle turbinate is normal though nearly in contact with the septum. On the other side the inferior turbinate is not so much congested, the meatus is open, therefore he has no obstruction about the nose. Yet the fact remains that this child is a confirmed mouth-breather.

We have examined both the nose and the throat and found no trouble in either to account for the obstruction to breathing, we have drawn the diagnosis down to the space between the two—the nasopharynx. It is impossible in a child of this age to make a direct examination of the nasopharynx. We have to make the diagnosis by exclusion. We have found no obstruction in the pharynx, we have found the nasal passages well open, perfectly patent, therefore the obstruction must be in the space between the two, and we have determined this by excluding everything else. There is something in this boy's nasopharynx which interferes with breathing, and we know in a child of this age there can hardly be anything else but an enlargement of the existing glandular tissue. If there existed a fibroma or a polyp we would have discovered some evidence thereof in our examination.

I would say, therefore, that this child is suffering from an enlargement of the glandular tissue in the nasopharynx, the so-

called adenoid vegetations. In order to clinch the diagnosis, and that is something you will undoubtedly be called upon to do many times, I will make a digital examination. I pass my finger into the nasopharynx and can distinctly feel the mass of glandular tissue I have attempted to describe. The sensation is like that of sticking your finger into a can of worms! In making this examination, especially in children, one must always take the precaution to press the cheeks between the teeth with the thumb and finger of one hand, so that the patient cannot close the mouth and in doing so bite the examining finger. The finger should be carried back through the mouth, and then upward into the nasopharynx the dome of which is covered by mucous membrane. If there exists enlarged lymphoid tissue it will feel like soft, mushy material which, as I have said, reminds one of sticking his finger into a can of fish-worms.

We find upon diligent inquiry that this child has also been partially deaf for some time, which is another important symptom, because deafness in a child of this age is a very serious condition, since it starts insidiously and develops so slowly that deafness becomes complete before the parents realize it. We will therefore examine this child's ears and see if they are normal. It is impossible to measure scientifically the hearing of a child of this age. The symptoms are usually so uncertain that one has to depend largely upon what one sees at the objective examination.

We have found a mass of enlarged glandular tissue in the nasopharynx in this case, and it is more than probable that this is the cause of the defect in hearing. We know that the ears are ventilated, so to speak, by air passing through the nose, and in order that hearing may be distinct there must be the same amount of pressure on both sides of the drum membrane. The normal pressure is about fifteen pounds to the square inch. If the drum cavity becomes a vacuum by blocking of the Eustachian tube the pressure from the column of air on the external side of the drum membrane will be relatively increased, thus forcing the drum membrane against the inner wall and almost completely obliterating the tympanic cavity, interfering with vibration of the drum membrane, interfering with the movement of the chain of bones, interfering

with the ossicles, and thus causing marked interference with the sound waves.

In a child of this age an obstruction of the nasopharynx by adenoid vegetations, may press directly upon the mouth of the Eustachian tube in such way as to block the passage to the middle ear, a vacuum is thus produced, external pressure continues, and partial deafness follows. The mother tells us that this child apparently hears much better at certain times than others. When he takes a little cold he becomes much worse so far as his hearing is concerned. Of course this is easily explained, for when there is congestion from cold the lymphoid tissue is necessarily increased in size and causes greater obstruction to the Eustachian tube, and when the congestion disappears a small amount of air finds its way through the Eustachian tube, pressure on the drum membrane is in a measure equalized, and there is consequently less interference with the sound waves. Sooner or later one of two things will happen, either the abnormal growth will exert sufficient pressure against the tube to narrow its calibre and cause permanent interference with ventilation of the middle ear and collapse of the drum membrane; or pressure of the air on the external side will force the drum membrane against the internal tympanic wall and become adherent to it. In either event pressure on the chain of bones seriously interferes with their action. There may even be more or less ankylosis, which interferes with the normal movements of the drum membrane so that deafness will result. We see, now, that there are four or five ways by which it is possible for obstruction in the nasopharynx to produce defective hearing.

Of course it may be asked, what can we do in a condition of this kind? The first thing we do is to inflate the drum membrane. One of the most useful of all instruments in otology is the Politzer air-bag. The principle involved in the use of this instrument is to force air into the Eustachian tube and finally into the middle-ear cavity. I have many times seen children with greater defect in hearing than the boy before us, in fact children who were almost totally deaf, who, after cleansing the nasopharynx of adenoid vegetations and sending a column of air through the Eustachian tube into the middle-ear, were restored to perfect hearing. One has only to open the Eustachian tube and fill the middle ear with air,

thus restoring the normal balance between the air on the outside and the air on the inside. That is the reason why the Politzer air-bag is the most valuable instrument in the entire armamentarium of the aural surgeon. The Politzer air-bag, however, is best adapted for use in children and in acute affections in the adult. In chronic conditions in the adult, this instrument does not send in a sufficient amount of air, and we have to use what is known as the Eustachian catheter. This catheter may be used in any case in the adult, but its employment, even if it were advisable, is impracticable in the child.

When I look into this child's ears I find the drum membrane in both ears collapsed. If the boy were old enough to answer intelligently our questions, we would find that he is more or less deaf in both ears. It is a difficult thing sometimes to tell when a person is deaf, because some people are able to detect certain sounds at certain distances while others are not, and yet the latter cannot be said to be deaf. The matter of training has much to do with hearing. The best test we have for defective hearing of course is the human voice, but this cannot be regarded as accurate because the voice of one person may carry better than that of another, and much depends again upon the character of the voice. Taking everything into consideration, it has generally been decided that the most reliable test is the tick of a watch. Here again we meet with difficulties, because all watches do not tick alike, and we know that a dollar Ingersoll or a Waterbury can be heard across the room. Of course we should always use the same watch in making our test.

I find that the watch I use for this purpose can be heard at a distance of forty-eight inches, therefore in making a record if the patient hears the watch tick at this distance with the right ear my entry would be: H. D., R. E. 48/48. If he hears it at a distance of thirty inches, then I would make the entry read 30/48. If he were only able to hear it at two inches the record would be 2/48. Of course this method is not strictly scientific, but it has proven of much practical value. While the patient might only be able to hear the watch tick at a distance of two inches yet in ordinary conversation one might not notice any defect in his hearing. There are many patients who say that they are not deaf, and that

there is nothing whatever the matter with their hearing, and yet, when we make this simple test, we find that they cannot hear the watch tick further away from the ear than two inches. Unquestionably such persons are deaf, but have not reached the point where it becomes apparent to themselves or others in ordinary conversation. There is a scientific explanation for the defective hearing in such cases, but discussion of that feature would not be in line with the subject before us.

In the manner I have indicated we make a record of what the patient hears. If this child were old enough so that we could accurately measure his hearing, we would do so and thus complete our record. After the aggregation of lymphoid tissue (the adenoid vegetations) is removed from the nasopharynx of this child, we will find that without any further treatment whatever, without even the use of the Politzer air-bag, his hearing inside of ten days or two weeks, will have greatly improved. If after this time we examine the ears we will find that the drum membrane has assumed a more natural plane.

Pathology

STUDIES UPON THE ETIOLOGY OF APPENDICITIS

BY DR. RICHARD KRETZ

of Prague

THE recognition of the relation of many cases of acute abdominal inflammation to disease of the appendix has hastened the progress of the surgical treatment of appendicitis within the past 25 years; and the results of this treatment have commanded the foremost attention of the medical world.

The appendices obtained by operation have formed a new basis of investigation concerning the development of this disease, which is apparently steadily increasing in frequency.

Two groups of cases may be distinguished without difficulty,—first, the acute febrile diseases, in which operation reveals an organ with evidence of recent inflammation; and second, the cases of chronic course, characterized frequently by attacks of appendiceal pain, showing at operation no signs of acute inflammation, but revealing an organ bound down by adhesions, and perhaps containing a foreign body or showing cicatrices in its walls.

At the time when anatomical investigation attributed the clinical picture of perityphlitis to the appendix, two forms of acute inflammation were recognized,—the gangrenous form and the phlegmonous form with purulent infiltration of the whole organ. As a consequence of these inflammatory processes, perforation of the appendix occurred early, and as small concretions, called fecal concretions were frequently found in such organs, their presence was brought into direct etiological relation with the pathological processes. But even then it had to be admitted that fecal concretions, as well as small foreign bodies, which might incidentally have been found in the inflamed appendix, could not be the universal cause of the inflammation; for these same inflammatory processes and even perforating abscesses could occur,

especially in children, without the finding of such abnormal contents, upon which the origin of the disease might be based.

In that period of time during which the operative treatment of appendicitis was developed, it was observed that the appendices obtained in an earlier stage of acute inflammation showed hemorrhages with extraordinary frequency. The picture in these cases may vary from a gross hemorrhagic infiltration of the diseased mucous membrane to discrete hemorrhagic points, confined to the follicles and occurring as solitary petechiæ or in groups. The significance of this observation was explained in various ways. The hemorrhagic infiltrating forms were usually taken as signs of severe inflammation. Concerning the solitary and especially the scattered small hemorrhages, the view of E. Fränkel was generally accepted,—namely, that they were due to extravasations of blood from injury during operation.

In the chronic cases of appendicitis the anatomical finding was more readily explained. The cases with evidences of local inflammation were referred to previous acute attacks, which had led to peritoneal involvement, to stenosis, etc.; while in other cases, where these localized changes were wanting, it was assumed that there had been an insidious chronic inflammation from the beginning (Ribbert, Oberndörfer).

Parallel with these anatomical classifications, attempts were also made to explain the heterogenous picture, especially of acute appendicitis from the bacteriological point of view. In this connection a distinction has been made between the cases of appendicitis caused by the pus microorganisms, especially the streptococci, and those produced by the normal inhabitants of the intestine, especially the bacterium coli.

In spite of the searching investigations made in these various directions, and in spite of the wealth of detail, with which the pathology of this disease has been worked out, the fundamental etiology, *i.e.*, the original cause of the disease of the appendix, still remained obscure. Various hypotheses were advanced. The frequent occurrence of small concretions in acutely inflamed organs led to the generally accepted theory, supported by the insidious development of these formations, that an accumulation of secretion with an inflammatory stenosis was responsible for the

dramatically rapid development of inflammatory changes in this section of the intestine, which is narrowest and at the same time richest in follicles. Although this theory is in accord with most experiences, it fails utterly to explain those cases, occurring especially in children, in which the most severe inflammations develop in anatomically normal organs.

At an early date the knowledge that the appendix was so rich in lymphoid follicles led to an anatomical and clinical analogy between appendicitis and angina. Talamon and Sahli especially have defended this view, and have called the acute form of appendicitis an angina of the appendix. Following their lead, Aschoff has recently described the acute form of appendicitis as taking its origin anatomically from the crypts.

While the views already mentioned usually attempt to explain the anatomical and clinical peculiarities of appendicitis upon the basis of the anatomical structure of the appendix (Nothnagel's skolikoiditis), other authors, comprising a decided minority, have attempted to bring the inflammations of this organ into relation with general infections. According to this theory they regard the disease of the appendix as a metastatic inflammation arising from a distant primary focus of inflammation. Kelynak in 1893 was the first to propound this theory; he regarded his case of appendicitis as a direct result of an attack of angina. Later Apolant reported a similar observation; and I myself have observed two similar cases, occurring close together, in which a streptococcus appendicitis accompanied a rather acute angina.

A similar view regarding the etiology of appendicitis has repeatedly been held in respect to the occurrence of a number of cases in certain localities or at certain times. In reference to an epidemic at Moscow, Globuloff made the direct assertion that appendicitis is to be regarded as an infectious disease.

The theory, that appendicitis is a localization of another primary infection, has received recent and considerable support from Adrian's investigations. This author considered the finding of influenza bacilli in the diseased appendix to be an evidence of hæmatogenous infection of the mucous membrane. In marked contrast to the negative results of many attempts to produce appendicitis by the introduction of foreign bodies, he was able to produce

in rabbits undoubted attacks in the richly folliculated mucous membrane of the cæcum by injecting into the blood various microorganisms.

Among the multitude of views presented, the observations of Kellynak and Apolant and the experiments of Adrian seemed to offer prospect of formulating a new and satisfactory theory of the etiology of appendicitis. Starting from this point of view, I have since 1900 systematically examined the anatomical, and later the surgical material at my disposal, and have practically come to the conclusion that appendicitis begins as a metastatic disease of the adenoid tissue, and that the lymphatic apparatus of the throat and nose is to be regarded as the most frequent primary localization and portal of entry of the infection.

The macroscopic appearance in cases of acute septic appendicitis—considering first the streptococcic infections—is a typical one. The patients are almost always quite young, being either children or adolescents near the age of puberty. They all possess a well developed lymphatic pharyngeal ring. Either on the pharynx or on the pharyngeal tonsil a swelling of the tissue is found with remains of exudate especially in the follicles. The surrounding cellular tissue is still plainly oedematous on one side or the other. On slight pressure abundant pus exudes from the crypts of the tonsil. The lymphatic glands of the retromaxillary space, in children often the pre-auricular glands also, are enlarged, oedematous and congested. In some glands the changes are more marked, the oedema extends to the capsule, and, extending from these large glands near the primary focus of disease, the lymphatic glands in the deeper layers of the neck also become enlarged and oedematous, down as far as the region of the scalene muscles.

The pathological condition in the neck is exactly the same as is found typically in osteomyelitis and endocarditis of bacterial origin. As such it is a positive sign of infection arising from the pharyngeal region of the neck, which infection has led to regional inflammation of the lymphatic glands and vessels; and this pathological condition of the neck is the remains of a previous passing of the infective agent into the blood of the superior vena cava. As the identical pathological conditions are found in acute septic appendicitis as in acute endocarditis and osteomyelitis, we

may assume, as the cause of appendicitis, the same bacteræmia that is held to be the connecting link between the primary localization of the infection in the throat and the metastatic inflammation in the bone marrow or endocardium.

In the case of appendicitis, however, another method of infection might be considered. Following the view of Kundrat, I believed at first that the abundant passage of pus-producing material into the gastro-intestinal tract with every act of swallowing, might finally overcome the normal protection afforded by the gastric and intestinal secretions. In this way the infective agent might penetrate the mucous membrane from the intestinal lumen, and thus give rise to the infection of the appendix. This theory was defended by Aschoff, who assumed a crypt infection from the anatomical point of view, and it certainly appears simpler and closer to the truth. But it is contradicted by the only positive animal experiments in producing appendicitis, *i.e.*, those in which Adrian produced the disease by infection of the blood.

In cases, which come to section, the infection has always been very severe, and the condition observed is one of fully developed local inflammation with general peritonitis. In the anatomical picture of such cases the inflammation of the organ is too far advanced to permit an accurate determination of the point of origin of the inflammatory process in the appendix. The only point that can be determined with any degree of accuracy is the marked involvement of the lymph-follicles in the mucous membrane. Therefore in the early part of the year 1907, when fresh cases of appendicitis occurred with great frequency in Vienna, I asked a number of my surgical friends to send me for examination the appendices from acute cases.

In this material, although a large part constituted positive streptococcus infections, the developed phlegmonous form of appendicitis was much less frequent than the familiar and typical hemorrhages seen in cases subjected to early operation.

The result of the minute anatomical examination of these cases is given in detail in the supplementary number of Vol. 28 of the "*Zeitschrift für Heilkunde*"; it is as follows: The earliest stages of the disease show an intact mucous membrane, with alterations in the blood-vessels at or near the centre of a lymph-

follicle. These vascular changes are accompanied by hemorrhage into the follicle with rapid disappearance of nuclear staining of the cells in the centre of the follicle. Simultaneously with this early hemorrhage, the wall of the appendix is thinned at the seat of hemorrhage and its lumen is correspondingly enlarged. These hemorrhages are accompanied by the passage of red blood-corpuscles, a few lymphocytes and some Gram-positive diplococci through the intact and non-inflamed mucous membrane, the epithelium of which likewise loses its power of nuclear staining even in the earliest changes.

If this part of the organ is examined in serial sections, there will be found in the earliest stages a small group of microorganisms along the course of a collapsed capillary in the centre of the hemorrhagic focus. In a somewhat later stage of the disease this will be replaced by a formation 3 or 4 times as large, which may most readily be compared with an accumulation of blood-platelets. This latter formation is quite characteristic, and it may remain in the tissue for some time; or it may pass into the lumen of the appendix with the stream of exudate, when the adenoid tissue, softened by inflammatory changes, is cast off. Therefore in cases of appendicitis, that come under observation in an advanced stage, or that heal spontaneously, the finding of this characteristic formation may be important evidence that the inflammation started with a primary affection of a blood-capillary in one of the lymph-follicles. This structure therefore renders possible the formation of a continuous series of anatomical findings, constituting the following picture of the pathological history.

First a pathogenic microorganism (in the cases here described usually the streptococcus) from the greater circulation enters the appendix, where it becomes arrested in a blood-capillary near the centre of one of the lymph-follicles in the mucous membrane. Under circumstances that are not yet sufficiently explained, this germ gives rise to a colony, which softens the wall of the blood-vessels locally. A hemorrhage then occurs and the microorganisms are washed out with the blood. From the colony of cocci there arises on the first day, in connection with the diseased vessel, the picture which resembles a group of blood-platelets.

The further destiny of such an embolic focus may be various.

In numerous cases the cocci in the centre of the follicle, as well as those which have made their exit from the vessel, become disintegrated. Then the red corpuscles become changed, being formed into spheroid and bell-shaped structures, which partly remain around the edge of the follicle and are partly absorbed by cells. The diseased capillary closes again, there is an exudation of polynuclear leucocytes, and in a few days the appearance of mitosis in the capillary endothelium, follicular cells and epithelium, leads to a complete restitution of normal conditions.

In other cases, representing a somewhat more severe type of the disease, an expulsion of the diseased follicle occurs, accompanied frequently by a marked secretion of fibrin. There arises thus in the mucous membrane a loss of substance, which is surrounded by a funnel-shaped mantle of lymphoid cells; serial sections will always show the diseased capillary in the deeper parts. This stage corresponds most completely with the pictures described by Aschoff in Berlin.

After expulsion of the follicle, a complete restoration to normal is also possible in this stage, with restoration of the continuity of the mucous membrane and also perhaps regeneration of the diseased follicle. On the other hand, if the expelled microorganisms are only partially annihilated in the surrounding mucous membrane, this stage may develop into a purulent phlegmon of the appendix with its dangerous consequences.

There is a variation from the above-described type of pathogenesis of acute metastatic inflammation in the mucous membrane of the normal appendix. This variation apparently is not rare, and may give rise to abscesses that may perforate the entire wall. In this form the primary hemorrhage in the lymph-follicle of the dilated intestinal wall may give rise to a laceration of the muscular coat, which would allow the hemorrhagic focus to reach the sub-serosa. By purulent softening of this extensive hemorrhage, a purulent focus is produced, which extends from the ruptured mucosa through follicle and musculature to the serosa, and naturally leads readily to a complete perforation. I consider these hemorrhages and their consequent perforations to be the result of rupture of the musculature, caused by contraction of the intact remainder of the muscular ring during attacks of colic.

The connection between acute septic appendicitis and disease of the throat is perfectly typical, according to the results of my post-mortem examination. But on theoretical grounds I do not consider angina to be the only possible means of invasion for the infection; the exciting agent of the bacteræmia may just as well come from some other locality, *e.g.*, a phlegmon, a puerperal process. On the other hand, no case of acute appendicitis has come under my notice, in which an abundantly developed adenoid tissue was lacking in the mucous membrane of the diseased appendix. Even in older patients with recurring disease, an abnormal wealth of follicles for the age of the individual was always a noticeable feature of the mucous membrane.

Further, appendicitis as an inflammatory process is not confined to one specific microorganism. This is shown by the experience of Adrian, as well as by the ordinary clinical bacteriological experience. However, infection with streptococci appears to be by far the most frequent, especially in cases of severe infection.

In regard to the danger of the process in the appendix, the interval of time elapsing between the primary angina and the secondary intestinal disease is of importance. Appendicitis, - which occurs simultaneously with the appearance of the acute pharyngeal symptoms is of a severe type while an interval of several weeks between the manifest angina and the appendiceal symptoms promises prognostically a less malignant disease.

The investigations and results already described had for their purpose the explanation of the cause of the first attack in a previously normal appendix. To elucidate disease symptoms in appendices already altered,—either in cases of constantly recurring attacks, or in cases where evidences of former disease have been found during operation for a supposedly first attack,—previous theories were based upon the assumption that stenoses and the formation of fecal concretions might account for the progress of the inflammatory symptoms. I agree at present with this theory, as far as it concerns infections with the intestinal flora.

From the conditions found in operative material which is much more suited to this investigation than the appendices showing the late stages of inflammation found in post-mortem material, this view appears to require a correction, in so far as the inflam-

mation in a majority of cases is found in the more intact parts of the mucous membrane. The disease attacks especially those parts still rich in adenoid tissue, in the neighborhood of a fecal concretion or a stenosis; while the atrophic mucous membrane in the bed of a fecal concretion or at a point of constriction is almost free of changes.

Among the cases with fecal concretions, two classes may be distinguished. In one class, less frequent and more benign, the concretion has perforated the wall by simple attrition. In the other more malignant class, the concretion may lie in the perforation, but the latter is the seat of fresh inflammation and does not constitute the old bed of the concretion. These last cases are to be looked upon as a migration of the concretion into the perforation; here the contents of the lumen play a part secondary to the causes of the inflammation of the wall, which are the same as in the cases in which the mucous membrane is primarily attacked.

On the other hand the recurrence of the infection through metastasis is of importance for the gravity of the case from other standpoints. In by far the greater number of cases of grave infections, even though the appendix is macroscopically intact, mitotic pictures and newly formed blood-vessels are to be observed under the microscope, thus showing, that in spite of the absence of all clinical and macroscopical signs of a previous inflammation, the mucous membranes of these appendices have passed through light attacks of this kind within a short period.

From what we know concerning the increase of reaction in the patient's tissues in the course of subacute and recrudescing infections, it is very probable, that the suddenness of the symptoms in the more severe cases is in part at least traceable to acquired local increase of tissue susceptibility, just as is the benignity of late post-anginal attacks to be considered a consequence of acquired increase of resistance and partial immunity.

Concerning the relations between the etiologically most important angina and the consequent invasion of the blood by the micro-organisms causing it, the older views have been changed through the knowledge acquired during the last few years, in so far, that it is now definitely known that the bacteræmia may occasionally be numbered among the first phenomena occurring in the course

of the throat infection and that on the other hand bacteria may reappear in the blood not only during lighter relapses, if of considerable duration, but also through the persistence of the inflammation of the cervical lymph-glands, if this is made suddenly worse by the patient taking cold or overexerting himself. This is quite as true for the angina as for the analogous disturbances of other internal organs, such as the heart valves, the pleura or the bone. I have been able to watch carefully a small number of cases in children over a long period of time, and it does not seem improbable to me, that such an infectious tendency may exist for years in the adenoid tissue of the pharynx.

A place of importance must also be accorded the infections occurring in the family, among people living under the same roof and children attending the same school; even though the inflammatory process should be localized in different parts of the body in individual patients, still an etiological connection may be considered to have been established, if the bacteria cultivated are the same,—for example, if the rather rare *Staphylococcus citreus* should be isolated—thus establishing a definite infectious group.

These opinions do not offer the practitioner new views for the support of operative indications; on the contrary, they are more suited to regain recognition for the opium method of treating appendicitis, as there can be no doubt that intestinal rest in the incipency of the inflammation is most suitable to prevent the dangerous entrance of the bacteria into the perifollicular lymph-paths, thus diminishing markedly the possibility of a peritonitis by contiguity.

A certain degree of prophylaxis, particularly regarding the most dangerous cases, those occurring in the course of a violent sore throat, is also theoretically possible through the opium treatment: the development of the bacteræmia from the standpoint of the number of bacteria entering the blood, is very decidedly dependent upon the rapidity of the lymph-current, as it conveys the disease-producing organisms to the blood; during rest the lymph-flow is very much slower than during activity. Rest in bed during acute inflammations of the throat would therefore be a measure to decrease the intensity of the bacteræmia and thus diminish the danger of the appearance of a metastatic infection.

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